

Corporate Climate Change Risk Assessment

ITEM 11.1 07/08/2020
Audit Committee

Strategic Alignment - Environmental Leadership

2019/01119

Confidential - s 90(3) (b) & (d) commercial advantage/prejudice commercial position of council/commercial information of a confidential nature

Program Contact:

Michelle English, AD Economic Development and Sustainability
82037687

Approving Officer:

Ian Hill, Director Growth

EXECUTIVE SUMMARY:

The City of Adelaide has undertaken an organisation-wide corporate climate risk assessment. The *Climate Change Risk Assessment Report* uses up-to-date climate modelling and considers governance and risk frameworks. The risk assessment included a review of climate change adaptation governance, the physical risks to assets and services, as well as transition risks and opportunities facing the organisation as a result of climate change.

The primary objective was to identify, review and assess climate change risks to assets, operations and services. By combining multiple methodologies to assess climate risk, this report presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. This report outlines the findings of the risk assessment and its recommended priority next steps.

It is proposed that a climate change adaptation action plan will be undertaken to address the findings of the Assessment Report and that it will be overseen by a cross-program steering group. This is proposed to be funded through the Climate Change Action Initiatives Fund in 2020/21.

It is recommended this report is considered by the Audit Committee in confidence as it provides information regarding potential risks for the City of Adelaide for which actions to mitigate the risks have yet to be further considered by Council.

RECOMMENDATION:

THAT THE AUDIT COMMITTEE

1. Notes the report and the *Climate Change Risk Assessment Report* as shown in Attachment A to Item 11.1 on the Agenda for the meeting of the Audit Committee held on 7 August 2020.
2. In accordance with Section 91(7) & (9) of the *Local Government Act 1999* and on the grounds that Item 11.1 [Corporate Climate Change Risk Assessment] listed on the Agenda for the meeting of the Audit Committee held on 7 August 2020 was received, discussed and considered in confidence pursuant to Section 90(3)(b) and (d) of the *Local Government Act 1999*, this meeting of the Audit Committee, do order that:
 - 2.1. The report, the discussion and any other associated information submitted to this meeting and the Minutes of this meeting in relation to the matter remain confidential and not available for public inspection until 31 December 2027.
 - 2.2. The confidentiality of the matter be reviewed in December 2021.
 - 2.3. The Chief Executive Officer be delegated authority to review and revoke all or part of the order herein and directed to present a report containing the Item for which the confidentiality order has been revoked.

IMPLICATIONS AND FINANCIALS:

CoA 2020-2024 Strategic Plan	Strategic Alignment – Environmental Leadership The City of Adelaide 2020-2024 Strategic Plan includes an objective to be a 'climate ready organisation and community'.
Policy	Not as a result of this report
Consultation	Internal consultation has been undertaken across the organisation to inform the report, including input from over 250+ staff and management.
Resource	Not as a result of this report
Risk / Legal / Legislative	The City of Adelaide (CoA) has exposure to physical risks, transition risks and liabilities related to climate risks. These include physical climate risks to assets and services, transition risks to business functions and liability risks from governance, information disclosure and planning decisions. This report informs CoA's risk exposure to climate change.
Opportunities	The report indicates that there are opportunities for the City of Adelaide to more fully integrate climate risk into its strategic planning, financial management, public risk disclosure, asset management, land use planning, emergency management and climate change policy.
20/21 Budget Allocation	It is proposed that a Climate Change Adaptation Action Plan responding to climate risks identified in this report will be undertaken in 2020/21. The cost of this work is \$35,000 and will be funded by the Climate Change Action Initiatives Fund.
Proposed 21/22 Budget Allocation	Not as a result of this report
Life of Project, Service, Initiative or (Expectancy of) Asset	Not as a result of this report
20/21 Budget Reconsideration (if applicable)	Not as a result of this report
Ongoing Costs (eg maintenance cost)	Not as a result of this report
Other Funding Sources	The Climate Change Risk and Governance Assessment report was co-funded (\$24,000) by the Local Government Association Mutual Liability Scheme (LGAMLS). This collaboration sought a sector based and useful tool for all LGAMLS members which will be made available as a physical risk template. CoA will investigate whether the Risk Incentive funding in October could be used to fund the Climate Change Adaptation Action Plan.

GROUNDINGS AND BASIS FOR CONSIDERATION IN CONFIDENCE

Grounds

This Item is confidential because the report outlines information on potential climate change risks and opportunities associated with City of Adelaide assets (key businesses, sites and infrastructure) and services. These risks include potential physical, financial, transition and legal liability matters that are yet to be fully investigated with appropriate mitigation measures implemented. Disclosure of this information could prejudice the City of Adelaide's commercial position in consideration of this risk mitigation.

Basis

This Item is confidential in nature because the report includes information on potential risks for which Council has yet to determine mitigations strategies.

Disclosure of this information could prejudice the City of Adelaide's commercial position.

Public Interest

The Audit Committee is satisfied that the principle that the meeting be conducted in a place open to the public has been outweighed in the circumstances because the disclosure of this information relates to a potential risk for Council's commercial position in risk mitigation considerations.

DISCUSSION

Background

1. The City of Adelaide (CoA) has considered the risk implications of climate change since 2009, when it participated in the LGA Mutual Liability Scheme's Local Government Climate Change Adaptation Program. This work included the development of a climate risk register which later informed the development of the CoA's *Climate Change Adaptation Action Plan 2011-2013* and the updated *Climate Change Adaptation Action Plan 2013-15*.
2. More recently, the CoA has focused predominantly on community climate risk exposure and adaptation, through its participation and coordination of the Resilient East Project, a collaboration with seven other eastern Adelaide metropolitan Councils. This collaboration resulted in the development of the *Resilient East Integrated Vulnerability Assessment Report* and *Regional Climate Change Adaptation Plan*.
3. The CoA has also been working on the implementation of climate adaptation priority areas, such as Hot Hot Hot! (preparing our community for the challenges posed by extreme weather), Water Sensitive Urban Design, Urban Greening, Reducing Urban Heat (heat mapping and Cool Road Adelaide trials) and planning submissions.
4. On two occasions, in June 2018 and August 2019, Sarah Barker, Special Counsel Minter Ellison presented to Council Members and Administration on the corporate governance, financial and liability implications of climate change risk.
5. At the Council Committee meeting in June 2018 Council indicated support for a corporate climate risk assessment to be undertaken to identify exposure of the organisation to physical, economic transition and liability risks.
6. In October 2018, the Audit Committee requested that a report on CoA's approach to climate risk be brought back to the Committee.
7. A report was presented to the Audit Committee in May 2019 which included a high-level outline of the corporate governance, financial and liability implications of climate change risk, including CoA's work to date and planned future work.
8. On 15 August 2019, the Audit Committee received a Corporate Climate Change Risk Presentation and noted that the CoA would commence a Climate Change Risk and Governance Assessment report. The Audit Committee requested that the Assessment be brought back to the Audit Committee.
9. In late 2019, the CoA invited the Local Government Association Mutual Liability Scheme (LGAMLS) to collaborate and co-fund the climate risk assessment. The LGAMLS has co-funded the project with the understanding that a brief guide and physical risk templates are made available to other local government authorities.

Global Trends – Assessing Climate Risk

10. Climate risk continues to grow on the global scale. The World Economic Forum identifies climate change in the top 10 global risks in terms of likelihood, and the top 10 global risks in terms of impact, “Severe threats to our climate accounted for all the Global Risks Report’s top long-term risks”, explicitly on “extreme weather events with major damage to property, infrastructure and loss of human life and failure of climate-change mitigation and adaptation by governments and businesses”.
11. While the CoA’s climate risk assessment commenced before COVID-19, pandemics and climate risk are similar in that they both represent *physical shocks*, as they translate into an array of socioeconomic impacts. Physical shocks can only be remedied by understanding and addressing the underlying physical causes. Both are *systemic*, in that their direct manifestations and their knock-on effects propagate fast across an interconnected world. Both pandemics and the climate change require the same fundamental shift from optimising for short term performance to long term resilience.
12. In April 2015, the G20 Finance Minister and Central Bank Governors requested that the Financial Stability Board (FSB) review how the financial sector accounts for climate related issues resulting in a common international disclosure framework. The FSB established an industry led Task Force on Climate Related Financial Disclosures (TCFD), chaired by Michael Bloomberg.
13. In June 2017, the TCFD released recommendations on the disclosure of climate risk to provide investors, lenders, and insurance underwriters with information to appropriately assess climate-related risks and opportunities and ensure the efficient allocation of capital. The TCFD categorised climate related risks into two major categories, risks related to the transition to a lower-carbon economy (e.g. policy and legal risk, technology, market and reputation risks) and risks related to the physical impacts of climate change.

Recent National Trends - Climate Risk

14. On 24 February 2020, the Australian Prudential Regulation Authority (APRA) published a letter to all APRA-regulated institutions outlining plans to develop a prudential practice guide focused on climate-related financial risks, as well as a climate change vulnerability assessment. Consultation on the new prudential practice guide is expected to commence in mid-2020 with its publication before the year’s end. APRA currently supervises institutions holding \$6.5 trillion in assets for Australian depositors, policy holders and superannuation fund members.
15. The 2019-20 devastating bushfires were exacerbated by drought conditions, very dry vegetation and soils, and record-breaking heat. They illustrated escalating climate risks that will continue to threaten livelihoods and well-being. The fires caused 33 deaths, destroyed more than 3,000 homes, and burned more than 10 million hectares of bushland. This type of disaster was predicted by the Bureau of Meteorology several decades earlier as a result of climate change.
16. In June 2020, for the first time, leading Australian experts in both physical climate change science and disaster modelling are working together with Australian financial institutions to provide consistent and comparable financial disclosure guidelines under TCFD recommendations for producers and users of such guidelines in the form of the Climate Measurement Standards Initiative (CMSI). The CMSI is led and funded by the National Australia Bank, the Commonwealth Bank of Australia, Westpac, Suncorp, QBE and IAG among others, and will draw its scientific expertise from the Earth Systems and Climate Change Hub, a partnership of five universities, the CSIRO and the BoM. This initiative is aimed at creating a common understanding of the physical risks from climate change and providing projections for future repair and replacement costs of residential and commercial buildings and infrastructure.

City of Adelaide Climate Change Risk Assessment 2020

17. The report, *Climate Change Risk Assessment Report* has now been finalised by consultants, Edge Environment and Climate Planning. The report identifies the CoA’s exposure to physical, transition and governance risks associated with climate change. A copy of the report is provided in **Attachment A**.
18. The *Climate Change Risk Assessment Report* (the Assessment) draws upon the previous research, risk assessments and plans undertaken by the CoA, including the *Climate Change Adaptation Report 2009 – Adelaide* (LGA Mutual Liability Scheme), *Climate Change Adaptation Action Plan 2011-2013*, *Climate Change Adaptation Action Plan 2013-15* and *Risk Management Operating Guidelines*, as well as the *Regional Climate Change Adaptation Plan 2016* and *Integrated Vulnerability Assessment* undertaken as part of the Resilient East collaboration.

19. The CoA considered emerging frameworks for the climate risk assessment, such as the TCFD, updated ISO 13001 and AS 5334—2013 frameworks (Climate change adaptation for settlements and infrastructure—A risk-based approach). This methodology enables benchmarking and includes organisational engagement to collect on-the-ground information from the staff that best understand their services and assets, and confirming the risks identified against their areas of responsibilities. Refer to Figure 1 below.

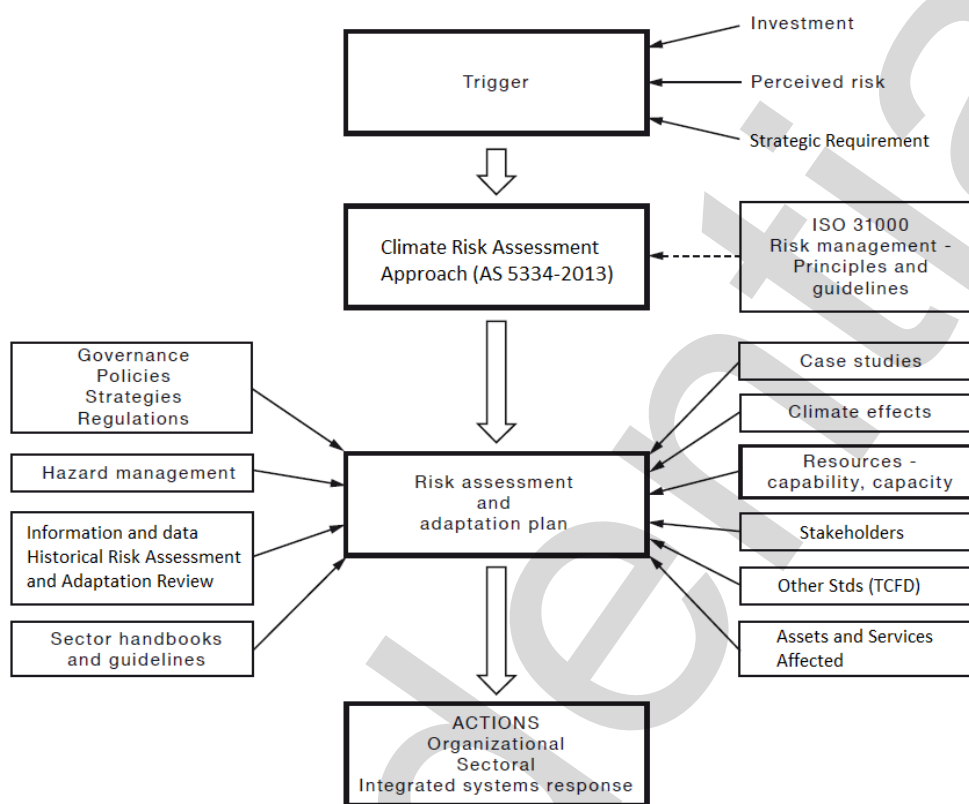


Figure 1 Adapted approach to Developing Climate Change Risk Assessment and Adaptation (AS 5334-2013)

20. The Assessment covers the following key aspects:
- 20.1. Identification and review of climate risks related to governance, services and assets
 - 20.2. Analysis of climate risk management (of existing and potential control measures)
 - 20.3. Risk management opportunities for climate risks (including prioritisation of risks)
 - 20.4. Disclosure (and controls measures) of climate risks.

Governance Risk Assessment

21. The Assessment identified Council's key publicly available corporate documents and involved a comprehensive analysis into how climate change is considered in decision making.
22. A key finding in relation to climate change governance was that CoA has a highly skilled staff base and is well-placed to become a national leader in the identification and management of climate change risks. Formal incorporation of climate change risk in the corporate risk management framework would deliver significant increases in CoA's climate governance risk measures.
23. Edge Environment consultancy utilised an established governance risk assessment tool (Informed.City™), which has been used by over 350 councils across Australia. The Assessment was informed by over 250 staff surveys and 10 workshops, as well as a document review of publicly available policies, planning documents and strategies. The Assessment included ten quantitative indicators, including four indicators that did not achieve a score. A summary of the scores against each indicator and evaluation of the CoA climate change adaptation governance is provided in Figure 2.

24. Ten Governance Climate Risk Indicators are rated from 0-4 scale, from 0 being non-existent, to 4 being advanced.

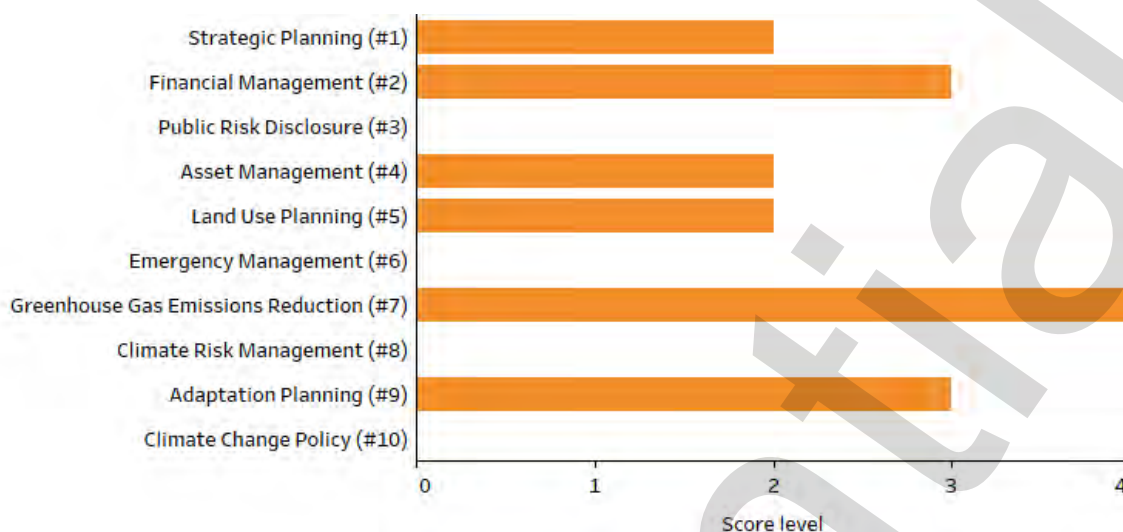


Figure 2 Governance indicator scores

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Detailed inclusion of climate change but is limited to two climate change issues AND/OR two council functions.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue AND/OR one council function only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) corporate climate change adaptation policy was found.

Table 1 Quantitative evaluation for climate change adaptation governance

Physical Risk Assessment

25. The physical climate risk assessment refers to the risks arising from the physical effects of climate change on operations, workforce, infrastructure, assets and services.

26. The physical risk assessment aligned with Risk Management Standard (ISO 13001) and was informed by interviews with 28 team leaders and managers, a review of all assets and services and short and long-term projections of climate change. The approach is summarised in Figure 3.

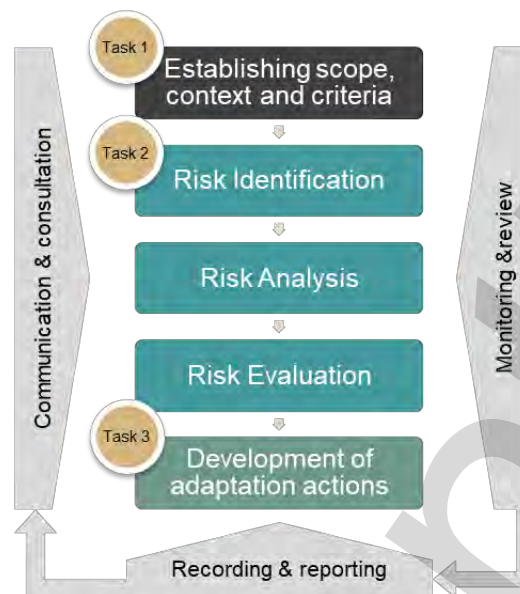


Figure 3 The climate risk assessment framework (adapted from ISO31000:2018)

27. Through the assessment, 283 individual risks to the CoA were identified. Over three quarters of the risks identified in this assessment were associated with the following climate variables:
- 27.1. Temperature: including both average temperatures increase as well as the increased frequency of very hot days and heatwaves; and
 - 27.2. Rainfall: including changing rainfall patterns, extreme rainfall and flooding events.
28. Figure 4 illustrates the proportion of climate risks related to each climate variable.

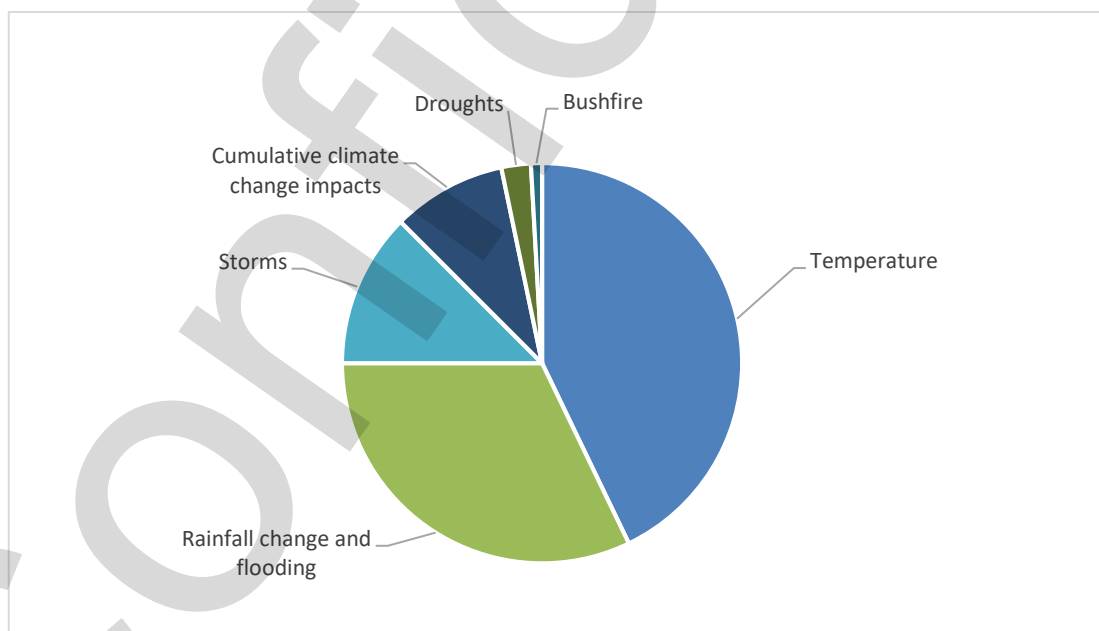


Figure 4 Proportion of climate risks by climate variable

29. Physical climate related risks common across all asset and service categories were:
- 29.1. Impacts of heat on people and the ability to deliver Council services, the reduction of people coming to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.
 - 29.2. Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, roads, or the golf links.

- 29.3. Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.
30. The highest physical risks related to CoA assets and service categories include the following, highlighted by key sites and services:
- 30.1. Key sites - Across all key sites, Adelaide Town Hall and UParks were identified as having the highest number of risks in total, followed by Rundle Mall, the Central Market and Golf Links. None of these had extreme risks for 2030, but all had a combination of high and extreme risks by 2090.
- 30.2. Parkland and open space assets - Several high risks were identified, including the increased mortality of trees and other vegetation on very hot days and resultant urban heat island implications, which was evaluated as a high risk for 2030 and an extreme risk for 2090.
- 30.3. Infrastructure - One extreme risk was identified for the short term, related to the stormwater and drainage network and was associated with eight extreme risks in 2090. Roads were also associated with high risks at 2030 and 2090.
- 30.4. Services - The services category had the highest number of individual risks across all groups, with 106 risks in total. High and extreme risks were common for cleansing (streets, toilets), events, community grants, homeless support, library services, horticulture, planning and building.

Risk ratings Asset or service grouping	2030				2090			
	L	M	H	E	L	M	H	E
Buildings	3	1	0	0	2	2	0	0
Parkland and open space assets	0	4	4	0	0	4	3	1
Infrastructure	13	21	22	4	8	11	29	12
Other	0	1	1	0	0	1	1	0
Key sites	28	38	32	0	17	34	40	7
Service group	15	42	48	1	4	24	59	19

Table 2. Total number of physical risks by asset or service grouping and risk rating across two timescales.

31. While this climate risk assessment does not represent a climate adaptation plan, putting in place control measures to mitigate risks could halve higher risks in the near term, and reduce the severity of nearly all extreme risks in the longer term.

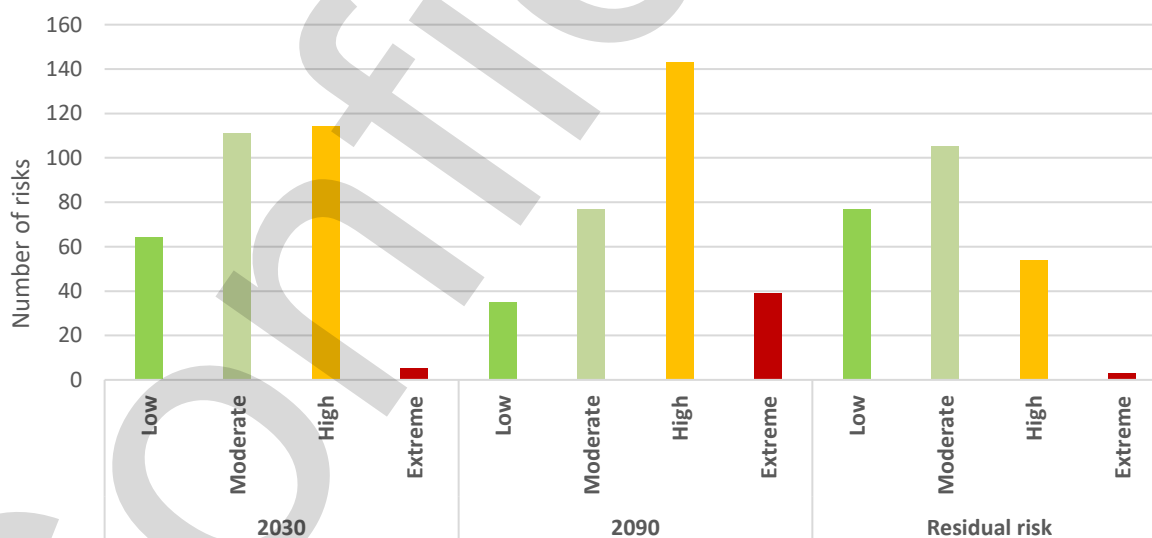


Figure 5. Total number of risks by time period and rating.

32. Liability measures – A range of liability risks were identified during the assessment, however, in the absence of independent legal opinion the extent of the legal liability risk cannot be quantified. It is recommended that Council consider obtaining legal advice regarding medium to extreme liability risks, especially in regard to the potential impacts from flooding.

Transition Risk Assessment

33. Transition risks result from the shift to a low carbon economy include those associated with policy; regulation; technology; markets and business models; and reputation and confidence. The key aim of a transition risk assessment is to identify and address climate transition risks and opportunities. A summary of highly ranked transition risk and opportunities include:
- 33.1. The Aquatic Centre has a high transition risk related to the gas-powered heating of the pool infrastructure.
 - 33.2. CoA businesses are reliant on shifting markets including tourism and the international student market due to reliance of carbon intensive air travel. It was identified that market changes in travel could drive the need for shifts in the city's revenue model.
 - 33.3. The Fleet is exposed to carbon emissions trading schemes.
 - 33.4. An integrated approach to carbon reduction initiatives is needed. It was noted that fleet and procurement policies including climate risk and emissions mitigation have been drafted, but further improvements could be made to better integrate emissions reduction initiatives.
 - 33.5. The State Planning Policies will inform development of the policies contained in the future Planning and Design Code. State Planning Policy requires developers to "minimise the adverse effect of decisions made under the Act on climate change and promoting development that is resilient to climate change". This includes the implications of a reported lack of resourcing and need to upskill team members to accommodate and enforce policy changes.
 - 33.6. The Property Portfolio is exposed to shifts to building performance requirements as the development of a carbon price may lead to several important transition impacts related to operational and capital costs, as well as asset value.
 - 33.7. UPark Adelaide is an important Council revenue stream associated with the provision of carparks across the Council area for public use. With a potential societal transition towards increased public, active transport and electric vehicles these assets may become stranded assets.
 - 33.8. Waste collection and management is exposed to carbon pricing given the likely cost implications on the waste sector as higher levels of resource recovery can come at a higher (rates funded) cost.
 - 33.9. CoA's reputation, brand and desirability as an organisation are also at risk due to changing consumer preferences

Climate Risk Assessment Recommended Next Steps

- 34. The Assessment Report presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. While CoA has a strong track record in relation to responding to climate change there is still significant work required to address current and emerging risks.
- 35. A large number of proposed adaptation actions are presented for consideration by CoA to address the identified climate risks. A summary of the priority next steps is provided below:
 - 35.1. Prioritise climate change governance actions – focus on indicators for which there is currently no information or that received a low score i.e. public risk disclosure, emergency management and climate change policy.
 - 35.2. Public disclosure of risks – use the information in the Assessment Report to generate a public facing document that can be used to increase public awareness of CoA's current and emerging risks.
 - 35.3. Incorporate physical and transition risks into CoA's risk register – use the results of the Assessment Report to update CoA's corporate risk register and assist to prioritise adaptation options for implementation.
 - 35.4. Develop an adaptation roadmap – use the findings of the Assessment Report to inform an adaptation action plan that identifies the highest priority adaptation measures and how their implementation will be sequenced through time.
 - 35.5. Liability measures – legal liability risks were not able to be quantified in the Assessment. CoA should consider obtaining legal advice for medium to extreme liability risks, especially in relation to the potential impacts from potential future flooding.

Next Steps

36. It is proposed that the following next steps will be undertaken by the CoA to respond to the findings of the Assessment Report:
- 36.1. Develop a Climate Change Adaptation Action Plan to address identified governance (eg public disclosure), priority climate risks, associated adaptation measures (eg risk and action register) and timing of implementation.
 - 36.2. Establish a cross-program steering group to oversee the implementation of the Climate Change Adaptation Action Plan.
-

ATTACHMENTS

Attachment A - Climate Change Risk Assessment Report

- END OF REPORT -

Report for the City of Adelaide

Climate Change Risk Assessment Report

29 June 2020



EDGE

Prepared for:

The City of Adelaide

Prepared by:

Edge Environment and Climate Planning

Contact:

Mark Siebentritt - Director

Edge Environment

106 Gilles Street, Adelaide SA 5000

08 8232 4823 - mark.siebentritt@edgeenvironment.com

Citation for consolidated report:

Edge Environment and Climate Planning. 2020. Climate Change Risk and Adaptation Governance Assessment Report for the City of Adelaide. Prepared for the City of Adelaide, June 2020

Citation for Climate Change Adaptation Governance Assessment Report (Appendix A):

Climate Planning and Edge. Environment 2020. South Australia Climate Change Adaptation Governance Assessment: Climate Change Adaptation Governance Assessment Report for the City of Adelaide. Prepared for the City of Adelaide, June 2020.

Disclaimer

The information contained in this report is given in good faith and has been derived from sources believed to be reliable and accurate. Edge Environment accepts no legal liability for the accuracy of field data, analytical results or mapping data provided as part of this report or for any associated loss in productivity, business or such like through third part use of this data.

Edge Environment accepts no legal liability for failure of third parties to obtain any necessary government or other agency permits or approvals with respect to any issue raised in this report where approvals may be required. The material and opinions in this report may include the views or recommendations of third parties, which may not necessarily reflect the views of Edge Environment, or indicate Edge Environment's recommendation regarding a particular course of action. Edge Environment does not provide advice of an investment or commercial valuation nature. Edge Environment does not accept any liability for investment decisions made on the basis of environmental or other information provided in this report.

Revision	Revision Details	Author	Approved by	Date Approved
V1	DRAFT	Mark Siebentritt, Tim Watson, Donovan Burton, Chloe Portanger, Elizabeth Cuan	Mark Siebentritt	12 June 2020
V2	FINAL	Mark Siebentritt, Tim Watson, Donovan Burton, Chloe Portanger, Elizabeth Cuan	Mark Siebentritt	29 June 2020

Executive summary

Context

Climate change is impacting all aspects of life in Australia, from the way that our communities function through to the response of our economy and environment. The impact of a changing climate has already been demonstrated in Adelaide, illustrated through recent experience with bushfires and extreme heat in the 2019/20 summer, storms in 2016 and the Millennium Drought prior to that. While the potential impacts of climate change for Adelaide and its community are significant, the City of Adelaide already has a track record as a council leading the way on taking action on climate change at a national and international level. This is demonstrated by the Carbon Neutral Adelaide initiative and Council's commitment to 100 per cent renewable electricity for its operations. The Council also declared that climate change poses a serious risk to the people of Adelaide, and it should be treated as a national emergency. These actions are underpinned by a commitment by the City of Adelaide to be one of the world's first carbon neutral cities and an international leader in environmental change.

Despite recent progress, the focus of action on climate change has started to evolve significantly and this needs to be accounted for in future decision making by all councils. The emphasis has now expanded to recognise that from a legal and liability perspective climate change is a "material" risk which must be addressed by directors of private companies and public authorities. Informed by initiatives like the Taskforce on Climate Related Financial Disclosures Framework, the response to climate change is now being assessed by more broadly considering physical risk (the risks posed by a different future climate change), transition risk (the risks of transitioning to a low carbon economy) and climate change governance.

During the delivery of this project, which took place from October 2019 to June 2020, the COVID-19 outbreak occurred significantly impacting on the approach to delivery of this project. It also highlighted how potential risks at an international scale, if not identified and prepared for, can have a major impact on the operations of organisations from across the community and economy. Parallels have been drawn between COVID-19 and climate change in this regard.

Purpose of this assessment

The primary objective of this climate change risk assessment, which was delivered by Edge Environment and Climate Planning, was to review and assess climate change risks to the City of Adelaide's assets, operations and services.

The project differentiated between three key considerations in identifying and responding to climate change risk, those being:

- Climate change governance;
- Physical risk; and
- Transition risk

By combining multiple methodologies to assess climate risk, this report presents one of the most comprehensive assessments of climate risk and its underpinning governance currently undertaken for a South Australian council. The project relied primarily on phone call interviews rather than meetings and workshops due to the response to the COVID-19 outbreak.

Climate change governance assessment approach and findings

The City of Adelaide climate change adaptation governance assessment used Climate Planning's *Informed.City* climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance of Council. The tool provides a systematic way of assessing climate change governance and has been used for over 350 councils across Australia.

The governance assessment for the City of Adelaide was undertaken using a quantitative and qualitative assessment. These drew on the results from an online staff survey, results of an assessment of corporate governance documents, and findings from face-to-face meetings with representatives of Council. In total, over 250 staff were involved with the process and 13 corporate governance documents were reviewed. The assessment predominantly focused on adaptation governance.

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. A summary of quantitative climate change governance assessment scores is provided in Table 1. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly. With the completion of the physical and transition risk assessment through this project, the evidence base is available to effectively address climate change risk in the corporate risk management framework. The full governance report is provided at Appendix A.

Table 1. Quantitative climate change governance assessment scores.

Indicator	Level
Strategic Planning	Intermediate
Financial Management	High
Public Risk Disclosure	No data
Asset Management	Intermediate
Land Use Planning	Intermediate
Emergency Management	None
Greenhouse Gas Emissions Reduction	Advanced
Climate Risk Management	No data
Adaptation Planning	High
Climate Change Policy	None

Physical risk assessment

The approach to assessing physical risk was designed to align with ISO 13001, AS 5334—2013 (Climate change adaptation for settlements and infrastructure—A risk-based approach) and Council's Risk Management Operating Guidelines. Risks were identified in consultation with Council for key service, assets and infrastructure. Risks were assessed for two climate change scenarios; an intermediate emissions trajectory (RCP 4.5) by 2030 and a high emissions trajectory (RCP 8.5) by 2090.

Through the assessment, 283 individual physical risks to the City of Adelaide were identified. Over three quarters of the risks identified in the assessment were associated with:

- Temperature: including both average temperatures change as well as the increased frequency of very hot days and heatwaves; or
- Rainfall: including changing rainfall patterns, extreme rainfall and flooding events.

There were five extreme risks identified for the near future (2030) and 39 for the far future (2090), which is likely the result of increasing uncertainty and severity of climate change impacts toward the end of the century.

A projected increase in the frequency of very hot days was the highest source of risk overall (72 risks for 2030), and it also had the highest number of significant (high and extreme) risks for both the near and far-future assessments (38 and 53 risks respectively). This was followed by the effects of heatwaves (56 risks in total) and flood-related impacts (53 risks).

Across the City of Adelaide's operations, the asset or service area grouping with the highest number of individual risks was the Service group and Key sites. Infrastructure (including bridges, roads, drainage and footpaths) was also a significant source of risk.

Asset or service grouping	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Service group	15	48	53	1	4	28	65	20	117				
Key sites	30	40	32	0	17	36	42	7	104				
Infrastructure	12	21	22	4	8	10	29	12	60				
Buildings	3	1	0	0	2	2	0	0	4				
Parkland and open space assets	0	4	4	0	0	4	3	1	8				
Other	5	1	1	0	0	5	2	0	7				
Total	65	115	112	5	31	85	141	40					

In summary, the risks common across all categories were:

- Impacts of heat on people and the ability to deliver Council services, the desire for people to come to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.
- Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, streetscapes, Crown Land or the golf links.
- Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.

In addition to the risks to specific infrastructure elements, several other extreme risks were identified to the infrastructure management approach more broadly. These risks include:

- The lack of consideration of acute climate change effects in new asset design;
- The unknown actual and potential impacts of climate change across the existing asset portfolio and strategic businesses; and
- A lack of data collection across infrastructure assets to understand and proactively manage climate related impacts.

These risks all have potentially significant cost implications for the near and far future. Several adaptation actions were identified to address these risks, including:

- Foster innovative thinking to develop policies and position of Council to support the consideration of climate impacts in new asset design and explore opportunities to learn and share across council business units.
- Development of targets in long term financial plans related to climate change resilience that translates to actions in asset management plans.
- Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be built out to manage key risks.

It is common practice to ensure that extreme and high risks can have their residual risk rating reduced to moderate or lower once adaptation measures are implemented. Based on the adaptation measures identified in this risk assessment, this is possible for some but not all risks. Council needs to determine whether further identification of adaptation measures is required or whether it is willing to accept high risks in some instances.

One of the five consequence areas considered in the physical risk assessment was "liability" risk. It is important to note that the risks identified as a "liability" risk in the risk assessment are general in nature and have not been identified by a legal professional. Given the complex nature and broad range of potential legal risk associated with climate change it is difficult to assign likelihoods or possibilities as per a traditional risk management approach. Instead it is prudent that all risks and risk management options be assessed by in-house and/or independent legal professionals.

Transition risk assessment

Given uncertainties around future carbon emissions reductions, it is becoming increasingly important for organisations to prepare for a range of climate change futures to promote resilience, including addressing risks from the social and economic transition to low carbon economies. Potential risks resulting from the transition to a low carbon economy that have been identified through the Taskforce on Climate Related Financial Disclosures include changes in policy, regulation, technology, markets and business models, and reputation and confidence.

The first stage of the transition risk assessment was to identify and adopt internationally recognised scenarios and their characteristics to inform the future characteristics of a global low-carbon future. These were then adapted to ensure relevance for local scale application and used as the basis of a transition risk materiality assessment.

A total of 32 transition risks to the City of Adelaide were identified, covering specific Council assets, business units and risks to Council's operational goals and community. Importantly, Council's Carbon Neutral Adelaide initiative means that Council is already well positioned to respond to transition risk. Transition risks were identified for the following services, assets and infrastructure: aquatic centre and gas utilities, business model, fleet vehicles, carbon management and procurement, planning, property, UPark Adelaide and waste services.

In addition to risks, the following priority opportunities were also identified:

- Utilities and solar energy: A key opportunity in relation to energy is the development of shared solar and demand management initiatives.
- Property portfolio: A range of high priority opportunities for transition resilience across the City of Adelaide property portfolio were identified including the development and management of micro energy generation and storage networks on Council assets.
- Climate leadership: Given the City of Adelaide's progress and goals towards zero neutrality, there is an opportunity to export sustainability knowledge.

Aside from the risk and opportunities listed above, the effects of carbon pricing should be considered so as to build future resilience. This may have important implications across Council, from increasing the cost of waste services to changing tenant profiles at key sites. The City of Adelaide should build on current emissions reduction initiatives to focus on reducing exposure to these risks by:

- Understanding carbon hotspots across organisational operations; and
- Integrating carbon considerations into procurement processes to allow for more targeted and effective emissions reductions initiatives.

Next steps

The City of Adelaide has already demonstrated strong commitment to responding to the challenges posed by climate change. Future action to address current and emerging physical and transition risks and climate change governance issues should include the following:

- Prioritise climate change governance actions;
- Public disclosure of risks;
- Incorporate physical and transition risks into Council's risk register;
- Develop an adaptation roadmap; and
- Liability measures.

Contents

Executive summary	1
1 Introduction	1
1.1 Context	1
1.2 Objectives and approach	2
2 Governance assessment	3
2.1 Overview.....	3
2.2 Method.....	4
2.2.1 Quantitative Assessment	4
2.2.2 Qualitative Assessment	5
2.3 Results.....	6
2.3.1 Results for Staff Governance Survey	6
2.3.2 Results and Recommendations for Quantitative Assessment	8
2.3.3 Results and Recommendations for Qualitative Assessment	12
3 Physical risk assessment.....	16
3.1 Method.....	16
3.1.1 Risk assessment approach	16
3.1.2 Risk register development	17
3.2 Results.....	17
3.2.1 High level risk findings	17
3.2.2 Key sites risk summary	20
3.2.3 Buildings	30
3.2.4 Parkland and open space assets	30
3.2.5 Infrastructure	32
3.2.6 Other	40
3.2.7 Services.....	40
4 Transition risk and opportunity materiality assessment	58
4.1 Overview.....	58
4.2 Method.....	58
4.3 Results summary.....	59
4.3.1 Risks.....	59
4.3.2 Opportunities	62
5 Key findings.....	63
5.1 Climate change governance	63
5.2 Physical risk.....	63
5.3 Transition risk.....	65
5.4 Next steps	65
References	67

Appendix A – Governance Assessment Report.....	68
Appendix B – Council staff interviewed.....	69
Appendix C – Transition risk and opportunity workshop attendees.....	70

1 Introduction

1.1 Context

Climate change is impacting all aspects of life in Australia, from the way that our communities function through to the response of our economy and environment. Projections for climate change indicate that without a coordinated global response, conditions will become more challenging as greenhouse gases continue to increase in the atmosphere over the coming century. In South Australia this will result in a range of changes, including warmer and drier conditions on average, increased periods of extreme heat and drought, more intense rainfall and greater fire risk.

The impact of a changing climate has already been demonstrated in Adelaide. For example, in September 2016 major storms brought down power lines leading to a collapse in the operation of the energy distribution network, combined with damaging winds and flooding. This event effectively shut down Adelaide for a period of 24 hours. More recently, extreme heat across the city and damaging bushfires in the peri-urban areas during the 2019/2020 summer directly impacted health and well-being across the community and resulted in direct impacts on trade in the city.

While the potential impacts of climate change for Adelaide and its community are significant, the City of Adelaide already has a track record as a council leading the way on taking action on climate change at a national and international level. For example, Council:

- Declared that climate change poses a serious risk to the people of Adelaide, and it should be treated as a national emergency;
- Made significant progress with the Carbon Neutral Adelaide initiative;
- Participated in the development of the Resilient East Climate Change Adaptation Plan; and
- Committed to 100 per cent renewable electricity as part of a power purchase deal from 1 July 2020 for the City of Adelaide's operations.

Over the last 3-5 years, the focus of action on climate change has started to evolve significantly. In the past, much of the work centred on adaptation to a different future climate and mitigation actions to reduce greenhouse gas emissions. However, the emphasis has now also expanded to recognise that from a legal and liability perspective, climate change is a "material" risk which must be addressed by directors of private companies and public authorities. This has grown out of international and national legal opinion with the expectation that the responsibilities of directors of public authorities in responding to climate change is likely to be at least as significant as it is for directors of private companies.

The greater focus on the liability aspects of climate change risk has been accompanied by the rapid growth of the Taskforce on Climate Related Financial Disclosures Framework (TCFD), established by the Financial Stability Board in 2016. This initiative, which has a primary focus on large publicly listed, private sector businesses, is now having trickle down impacts on how the broader economy functions. This is reshaping how climate change risk is understood and responded to and recognises that climate change poses two key types of risk:

- Physical risk – The risks posed by a different future climate change; and
- Transition risk - The risks of transitioning to a low carbon economy.

In addition to differentiating between physical and transition risk, the TCFD also highlights the importance of governance in taking action on climate change, with a focus on how decision making within organisations accounts for climate change risk.

1.2 Objectives and approach

The City of Adelaide 2020-2024 Strategic Plan lists as an outcome the aim of being a “climate ready organisation and community” and a strategic priority to “Lead the way in climate action and manage water, waste, transport and greening in a sustainable way”. In addition to emission reduction and sustainability activities, the Council has exposure to climate-related risks.

The primary objective of this climate risk assessment, which was delivered by Edge Environment and Climate Planning, was to review and assess climate change risks to assets, operations and services, covering the following key aspects:

- Identification (and review) of climate risks against service and assets;
- Analysis of climate risks (existing and residual);
- Risk management for climate risks (including prioritisation of risks);
- Disclosure (and controls measures) of climate risks (including financial implications for high level risks).

The project differentiated between three key considerations in identifying and responding to climate change risk, those being:

- Climate change governance - Section 2;
- Physical risk – Section 3; and
- Transition risk – Section 4.

Climate change governance was assessed using the *Informed.City* tool developed by Climate Planning. The tool provides a systematic way of assessing climate change governance and has been used for over 350 councils across Australia. This report provides a summary of the governance assessment process and key findings. The full governance report is provided at Appendix A.

The approach to assessing physical risk was designed to align with ISO 13001, AS 5334—2013 (Climate change adaptation for settlements and infrastructure—A risk-based approach) and Council's Risk Management Operating Guidelines. This report provides a summary of the physical risk assessment process and key findings.

Transition risk was also assessed in a manner consistent with ISO 13001 and AS 5334—2013, as well as being aligned to the TCFD guidelines and identified material transitional risk areas associated with Council's operations, including:

- Market and technology shifts;
- Policy and legal; and
- Reputation.

The physical and transition risk assessment phases relied primarily on phone call interviews rather than meetings and workshops due to the response to the COVID-19 outbreak.

2 Governance assessment

The governance assessment undertook a systematic analysis to determine how climate change is factored into the City of Adelaide's decision making.

2.1 Overview

The governance assessment undertook a systematic analysis to determine how climate change is factored into the City of Adelaide's decision making.

The extent to which climate change risk and adaptation is considered in a local government's core governance documents may affect the implementation of the organisation's approach to climate change adaptation.

Measuring and monitoring indicators for climate change adaptation and mitigation governance provide a platform for a consistent approach. This allows local governments the ability to monitor and improve their performance over time. Initial focus and emphasis should be on a council's adaptation governance. Unless it can be ensured that a council's internal adaptive capacity is robust, that is its ability to respond to potential climate change impacts, then there is a risk that specific adaptation actions will be ad-hoc and constrained by limited resourcing and political support.

Understanding climate change governance may help decision-makers to estimate the vulnerability of a system to stress and address underlying causes of vulnerability over time. It may help to support proactive decision-making by assisting organisations to identify both the risks and possible responses in advance and develop the capacity to implement the required actions.

The need to focus on climate change governance is gaining momentum in academic literature, United Nations publications and approaches, as well as in corporate disclosure frameworks (Clos, 2015). For example, disclosure of governance arrangements around climate-related risks and opportunities is a key component of the recommendations of the Financial Stability Board's [Task Force on Climate-related Financial Disclosures](#) (TCFD) (see Figure 1).



Figure 1. Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016).

This section of the report presents a brief overview of the methodology and results of an analysis about the extent of climate change adaptation governance for the City of Adelaide. It includes the information collected from an online staff survey, results of the governance assessment, and findings from face-to-face meetings with representatives of the City of Adelaide.

This assessment predominantly focuses on adaptation governance. Mitigation has been considered only regarding formal greenhouse gas emissions reduction targets. A detailed greenhouse gas emissions governance assessment requires an audit of baseline emissions data and data recording

protocols (e.g. emissions scope, alignment to Australian standards etc.) – which is outside the scope of this project.

The full climate change governance assessment report is provided at Appendix A.

2.2 Method

The City of Adelaide climate change adaptation governance assessment uses Climate Planning's *Informed.City* climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance of Council. The governance assessment for the City of Adelaide was undertaken in two stages: quantitative assessment and qualitative assessment.

2.2.1 Quantitative Assessment

The aim of the quantitative assessment was to identify publicly available corporate documents for the City of Adelaide and undertake a deeper exploration into how climate change is considered in those governance documents. These corporate documents are the key governance documents that either drive the organisational decision-making or report on the effectiveness of those processes. The documents were assessed against ten quantitative indicators for climate change adaptation governance as follows:

- Strategic Planning;
- Financial Management;
- Public Risk Disclosure;
- Asset Management;
- Land Use Planning;
- Emergency Management;
- Greenhouse Gas Emissions Reduction;
- Climate Risk Management;
- Adaptation Planning; and
- Climate Change Policy.

Justification for each indicator is provided in the full report at Appendix A.

The quantitative assessment focusses specifically on an assessment of Council's corporate documents which are publicly available which means they are accessible through an online platform (e.g. Council's website). An analysis of only public documents supports the growing recognition that disclosure of climate risk is an important element in climate change management. The Paris (Climate) Agreement recognises transparency as a fundamental principle in climate change management (both in actions and in governance). There is also an increasing call for local government disclosure of risk and governance responses by those who re-insure local government risk.

Keyword analysis

Publicly available corporate documents were identified from the City of Adelaide which align with the ten quantitative indicators of climate change adaptation governance (see Table 2). The team conducted a keyword analysis to identify how many words associated with climate change were present in Council's documents. Some of the words reviewed include 'climate change', 'adaptation' and 'greenhouse gas emissions' (a complete list of words can be found in the full governance assessment report at Appendix A). If any of these words were identified, closer analysis was undertaken of the context to assess the extent of how they were considered in the documents.

Table 2. The City of Adelaide's corporate documents identified for the quantitative assessment.

Indicator	Document Name
Strategic Planning (#1)	▪ Strategic Plan 2016-2020
Financial Management (#2)	▪ Integrated Business Plan 2019-2020
Public Risk Disclosure (#3)	
Asset Management (#4)	<ul style="list-style-type: none"> ▪ Building Asset Management Plan 2016 ▪ Infrastructure Asset Management Policy 2020 ▪ Park Lands Open Space Asset Management Plan 2016 ▪ Transportation Asset Management Plan 2017 ▪ Urban Elements Asset Management Plan 2016 ▪ Water Infrastructure Asset Management Plan 2016
Land Use Planning (#5)	<ul style="list-style-type: none"> ▪ Development Plan 2020 ▪ Adelaide Design Manual 2016
Emergency Management (#6)	▪ Eastern Adelaide Zone Emergency Management Plan 2018
Greenhouse Gas Emissions Reduction (#7)	▪ Carbon Neutral Strategy 2015-2025
Climate Risk Management (#8)	
Adaptation Planning (#9)	▪ Resilient East Regional Climate Change Adaptation Plan 2016
Climate Change Policy (#10)	

Evaluation Matrices

Corporate documents were assessed for each governance indicator using a scoring system developed by Climate Planning. The method is relatively simplistic as it uses scaled matrices with descriptions on a continuum between no consideration and an advanced consideration of climate change. Corporate documents were scored using a five-point scale which was tailored to each governance indicator in the quantitative assessment (these evaluation matrices are provided in Section 4.2).

Since the quantitative assessment relies on an analysis of the corporate documents, Council staff were not directly engaged for the quantitative indicators. Although, some findings obtained from the face-to-face meetings may inform and/ or provide context about some of the quantitative indicators and will therefore be presented in the results where relevant. However, they are not given any weight in the final conclusions of this report (other than limitations/ barriers to mainstreaming noted by the staff).

The findings in this report are based on a quantitative assessment of the City of Adelaide that was completed on the 24th of February 2020.

2.2.2 Qualitative Assessment

The purpose of the qualitative assessment was to build a more complete representation of climate change adaptation by focussing on the complex drivers which could not be understood through an assessment of public corporate documents in the quantitative assessment. These drivers are captured in seven qualitative governance indicators:

1. Climate Risk Assessments;
2. Climate Legal Risk;
3. Staff Capacity and Resource Allocation;
4. Community/ Stakeholder Engagement;
5. Institutional/ Intergovernmental Relationships;

6. Climate Change Information; and
7. Information Systems.

Justification for each indicator is provided in the full report at Appendix A.

Face-to-face meetings were undertaken with representatives from the City of Adelaide. During the meeting conversations, representatives were asked a series of questions which were then later used in a qualitative analysis to understand the issues, and barriers and enablers for considering climate change in decision making for the City of Adelaide. The information was obtained through a set of consistent questions aligned to the relevant themes.

The results collected through the qualitative assessment are not directly attributed a 'score'. The findings from this assessment are used to build a better understanding about some areas of this indicator that may not become evident through a reading of the documents in isolation. While are not attributed a score, the outcome will inform any discussion or recommendations. The face-to-face meetings for Council were conducted on the 19th and 20th February 2020.

2.3 Results

The results focus on key findings of the governance assessment as well as possible links drawn from a survey of staff members. This section first provides an overview of the results for the staff governance survey. It then addresses the results and specific recommendations for the quantitative and qualitative assessment separately. Any interesting findings from the face-to-face meetings or the staff governance survey which relate to a specific governance indicator have also been integrated into the results.

2.3.1 Results for Staff Governance Survey

Of the 254 staff members in the City of Adelaide who participated in the staff governance survey, the highest representation work in the Customer Service department (38 staff members, 15%). This is closely followed by the Water and Waste department which had 27 staff members (11%) participate in the online survey (see Figure 2). It is important to note that 254 respondents are considered a high response rate for an individual council's survey response.

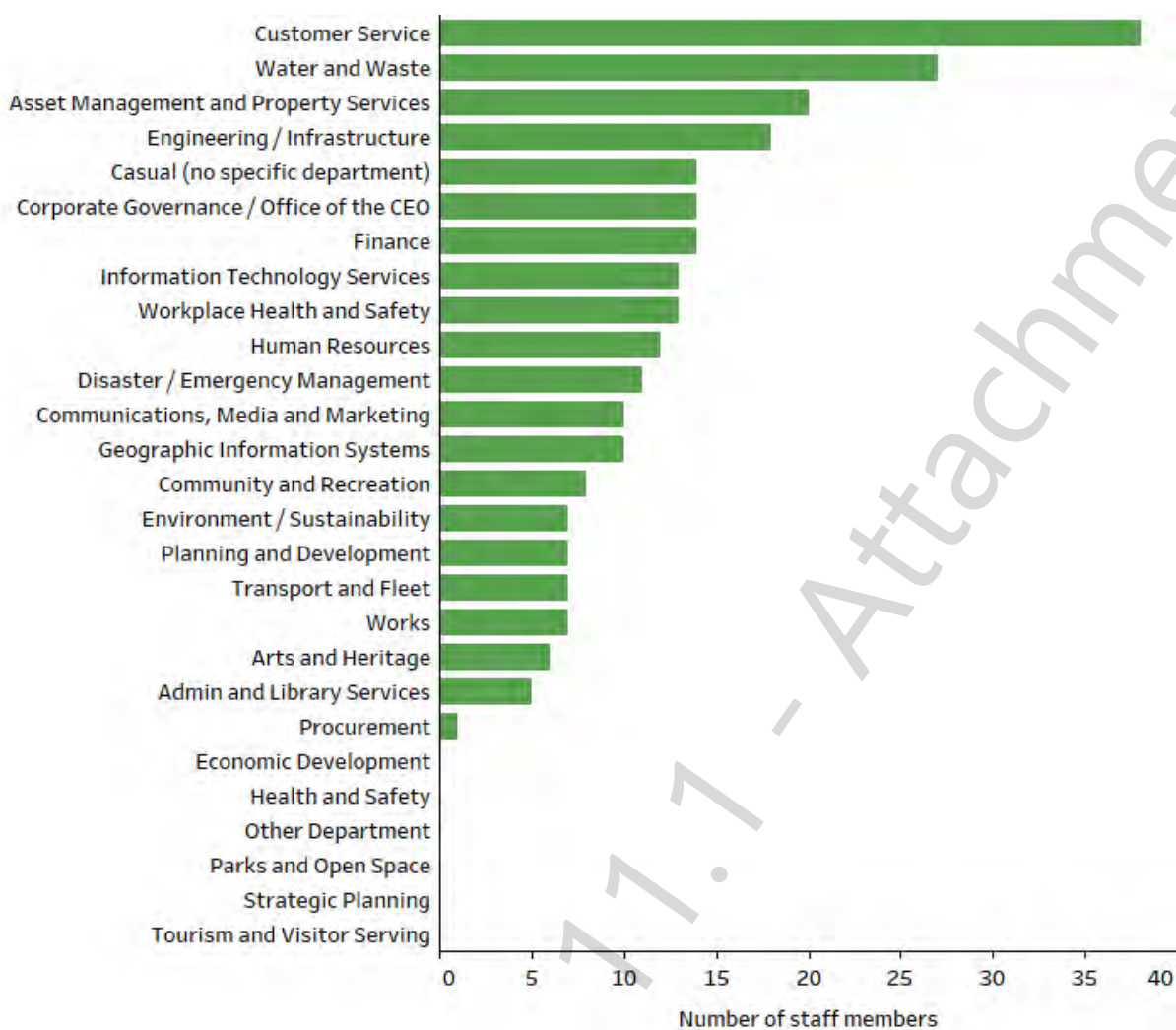


Figure 2: Number of the City of Adelaide staff members from each department who participated in the staff governance survey.

The online survey found that 86% of respondents have some level of understanding of climate change impacts and adaptation. There were 123 staff members who stated that their understanding is limited, and 93 staff members who believed that they could comfortably incorporate / consider climate change in their job (see Table 3). Furthermore, 144 respondents (64%) identified a good understanding of climate change as an enabler to Council's ability to plan for climate change.

Table 3. Understanding of climate change impacts and adaptation for the City of Adelaide staff members

	Number of staff members	% of staff members
I am not sure of my understanding	26	10%
I have no understanding	8	3%
My understanding is limited	123	49%
I could comfortably incorporate/ consider climate change adaptation	93	37%
Total	250	100%

2.3.2 Results and Recommendations for Quantitative Assessment

The specific results of the quantitative assessment have been divided into the ten quantitative indicators of climate change adaptation governance. This section will elaborate on the City of Adelaide's results for each governance indicator and provide specific recommendations for how council can transition to a higher score level. The analysis of each indicator will discuss the importance of the indicator, staff survey results, quantitative assessment results, and specific recommendations. Findings from the face-to face meetings will be provided for relevant indicators.

Only one recommendation has been provided for each indicator as a 'first step' for Council to transition to the next score level. These recommendations are specific to each level which means that completing one recommendation will only improve Council's score by one level. For this reason, there may be a range of recommendations which Council can implement to achieve a desired indicator score. For example, there are three specific recommendations which a council can implement to transition from 'Intermediate' to 'Advanced' for an indicator.

Overview of Quantitative Assessment Results

The governance assessment explored how climate change was considered in corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 3 displaying Council's performance.



Figure 3. The City of Adelaide's quantitative scores for climate change adaptation governance.

The evaluation matrix (see Table 4) provides a summary of the City of Adelaide's for each governance indicator including descriptions to explain how the indicators were assessed.

Table 4. The City of Adelaide's quantitative evaluation for climate change adaptation governance.

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. sea level rise) AND/OR one council function (e.g. land use planning) only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme. Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.

Quantitative assessment results

The rationale for the Quantitative assessment results are as follows:

Strategic Planning

The Strategic Plan 2016-2020 was reviewed for this indicator. The plan provides a diverse range of objectives to assist Council in becoming a carbon neutral city. The objectives focus on reducing greenhouse gas emissions in areas of energy and renewables, sustainability, biodiversity and procurement (The City of Adelaide, 2016). As a result, the City of Adelaide scored 'High' for the Strategic Planning indicator.

Financial Management

The Integrated Business Plan 2019-2020 was reviewed for this indicator. The plan considers climate change, specifically for the Climate Change Action Initiatives Fund. Through this fund Council seek to: *... invest in strategic incentive programs such as \$1.6 million for the climate change initiatives including the sustainability incentives scheme, sustainability performance improvement programs, low and zero emission vehicles, Carbon Neutral Adelaide Partners Program and Building Upgrade Finance.* (The City of Adelaide, 2019). Since the initiative aims to deliver a range of projects, programs and incentives, this sees the City of Adelaide score 'High' for the Financial Management indicator.

Public Risk Disclosure

The City of Adelaide's website was searched for a strategic risk register, however, no publicly available risk register was found. All corporate documents were reviewed from the other governance indicators however were unable to find any risk disclosure information. As a result, the City of Adelaide scored 'No data' for the Public Risk Disclosure indicator.

Asset Management

Six asset management documents were assessed for this indicator. All of Council's asset management plans consider climate change, with an emphasis on how these Asset Management Plans address Council's strategic planning actions to reduce carbon emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Asset Management indicator.

Land Use Planning

Two documents were assessed for this indicator, they were Council's Development Plan 2020 and the Adelaide Design Manual 2016. The review did not find keywords related to climate change in Development Plan. However, the Adelaide Design Manual specifically identifies the importance of street trees and plants in "preparing for the future challenges of climate change and creating a more climate resilient city" (City of Adelaide, 2016). The manual was included in this assessment as it provides strategic and technical guidance for the design and management of public spaces in the City of Adelaide. This sees the City of Adelaide score 'Intermediate' for the Land Use Planning indicator.

Emergency Management

Only the Eastern Adelaide Zone Emergency Management Plan 2018 was assessed for this indicator as a publicly available council emergency management plan was not found for the City of Adelaide. Since a consideration of climate change (or associated keywords) was not found in the plan, the City of Adelaide scored 'None' for the Emergency Management indicator.

Greenhouse Gas Emissions Reduction

A climate change target was searched for in Council's greenhouse gas emissions documents, other core governance documents identified in the quantitative assessment, and on Council's website. The assessment found a consideration to reduce greenhouse gas emissions in the Carbon Neutral Strategy 2015-2025 which establishes Council's aspiration to be a carbon neutral city. The strategy sets two emissions reduction targets. These targets are reflected in Council's Strategic Plan and Asset Management Plans. These results see the City of Adelaide score 'Advanced' for the Greenhouse Gas Emissions Reduction indicator.

Climate Risk Management

The City of Adelaide's website was searched for a risk management policy, strategy and/or plan. Since no publicly available risk management documents were found, the City of Adelaide scored 'No data' for the Climate Risk Management indicator.

Adaptation Planning

Only the Resilient East Regional Climate Change Adaptation Plan 2016 was assessed for this indicator as a publicly available council adaptation plan was not found for the City of Adelaide. This plan is Council's regional climate change adaptation plan which aims to provide a coordinated and collaborative response to climate change across the Eastern Region. The plan achieves these goals by identifying priority adaptation actions which will respond to the challenges and opportunities presented by a changing climate (Resilient East, 2016). This sees The City of Adelaide achieve a 'High' for the Adaptation Planning indicator.

Climate Change Policy

The City of Adelaide's website was searched for a climate change policy (which includes adaptation) and/or an environment/ sustainability policy, however, no relevant policies were found. This sees the City of Adelaide score 'None' for the Climate Change Policy indicator.

Using the scores identified above, a series of recommendations were identified that if taken, would assist council in increasing its score for each indicator (Table 5). This list of recommendations represents a summarised version of what is contained in the full governance assessment report at Appendix A.

Table 5. Summary of recommendations against quantitative indicators.

Indicator	Recommendations
Strategic Planning	To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc.". Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaning information from other councils through peer-to-peer learning.
Financial Management	To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented.
Public Risk Disclosure	No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Asset Management	In order to achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. The asset management plan should also specify a prescribed response to one of the climate change issues. To upgrade to a 'High' level of response, Council will also need to undertake some spatial analysis of its assets that may be affected by climate change issues (e.g. increase flood risk, extreme heat).
Land Use Planning	To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the <i>Informed.City</i> TM governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan.
Emergency Management	To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known

Indicator	Recommendations
	disaster risks and affect those already especially vulnerable to natural hazards".
Greenhouse Gas Emissions Reduction	Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.
Climate Risk Management	No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Adaptation Planning	This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders.
Climate Change Policy	A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an <i>Informed.City</i> TM climate change adaptation governance assessment and have an advanced climate change policy.

2.3.3 Results and Recommendations for Qualitative Assessment

The results for the qualitative assessment focus on the seven indicators that are identified as key drivers for implementing climate change adaptation governance. The key results from the qualitative assessment are described below, with the full description of the importance of the indicator, staff survey results, qualitative assessment results, and specific recommendations contained in the report at Appendix A.

Climate Risk Assessment

At the time of the interviews, staff noted that some specific risk assessments had been undertaken but no overarching project that explored all of council's climate change risks. The assessment described in this report performs this role.

Staff discussed numerous climate change related risks during the meetings including the potential:

- impact of extreme heat on residents and retail trade, especially in parts of the city with limited shade;

- greater requirements for support for heat stress for visitors to the city or for the homeless;
- impact of extreme heat on major outdoor events;
- influence of hotter and drier conditions on greening across the city and specifically tree health;
- increased requirements for irrigation due to longer periods of hot and dry conditions, which will in turn influence operating costs;
- increased costs for operating facilities and buildings due to greater need for cooling;
- further changes to work hours to reduce the need for staff to be outdoors during hot weather;
- devaluation of assets due to reduced performance and operating life; and
- increase in liability claims from hazards such as flooding.

Climate legal risk

The assessment found that Council has not sought independent legal advice for any specific climate related risks and that the respective role of Council compared to residents and businesses in responding to climate risks is unclear. There was a strong interest in better understanding what Council's statutory requirements are in relation to risk management. Some of the staff noted that they had attended a climate legal risk presentation and that it was an issue that was still in the embryonic stages of understanding within the organisation.

The City of Adelaide has not been required to attend court or a tribunal for any climate change planning issues (e.g. related to development applications). Furthermore, Council's insurer (the Local Government Association Mutual Liability Scheme) has not requested any specific information about how Council is managing its climate change risk. Participants did not identify any instances where Council had refused developments based on climate change risks.

Staff Capacity and Resource Allocation

There was broad understanding of the importance of climate change as an issue presenting risks and opportunities for Council. This awareness was driven to a large degree by the Council's commitment to the Carbon Neutral Adelaide initiative and to a lesser extent the Resilient East Regional Climate Change Adaptation Plan.

Many participants indicated an understanding of climate change adaptation activities directly relevant to their functional areas, covering both services and assets. While many staff stated they had a general understanding of climate change there was a consensus that additional tailored training would be beneficial. The staff noted that Council was supportive of professional development activities. Some staff expected that they were likely to be exposed to training from peak bodies as the issue emerged further.

Community/ Stakeholder Engagement

Community awareness about climate change has become an important driver for action within Council. This is reflected in Council's commitment to Carbon Neutral Adelaide and the declaration of a Climate Emergency. The City has a strong community engagement focus, working proactively with residents, businesses and other organisations such as universities. Examples of past Council engagement that supports climate change action includes heat preparedness messaging before and during heatwave events, participation in the Hot Hot Hot event and community engagement about the value of city greening using tree tags.

It was noted that there is a focus on being a "climate-ready" community in the Strategic Plan and messaging with the community is centred on empowerment rather than a "fear-based" approach. Participants did not identify any instances where Council has worked with Indigenous traditional owners of the land regarding climate change issues.

Institutional/ Intergovernmental Relationships

There was a view among some participants that the relative roles and responsibilities of local government as compared with the State Government about responding to climate change was unclear at present. It was suggested that this issue requires clarification as part of the next phase of climate change planning within Council.

Climate Change Information

The City of Adelaide has used information about climate change from the IPCC, CSIRO, the Bureau of Meteorology, and various other scientific organisations, as presented and summarised in the Resilient East Regional Climate Change Adaptation Plan. This information is also being used as the basis of the current physical risk assessment. It was also noted that information such as the urban heat mapping has been used to build the business case for investment in greening, WSUD and inform discussion regarding materials selection.

At the face-to-face meetings some staff stated that they were likely to have climate change information readily available but were unsure about which information they should be using. It was noted by some staff that a climate change policy would help direct staff to robust information sources including what type of climate projections information should be used.

Council has not made a formal whole-of-council decision regarding the sharing of information with the community or business owners regarding areas or assets that may be at higher risk due to climate change hazards.

Information Systems

Council's website was analysed for climate change and its integration with other information systems. The website includes working connections to six social media platforms including Facebook, Twitter, Instagram, LinkedIn, YouTube, and WeChat. Also, the website has a dedicated page for climate change which explains the projected climate trends for the City and shows projects Council are working on to respond to climate change, including the Resilient East Regional Climate Change Adaptation Plan. The City of Adelaide has also established an online community hub called 'Your Say Adelaide'. This website is a consultation hub where the community can engage with Council and have their voices heard about issues in the region.

The City of Adelaide has a Facebook account which has 51,449 'likes' and 53,967 people following the page (as of February 2020). Council have also been a member of Twitter for 11 years (joined in February 2009) and in that time have gained 97,400 followers. These statistics show that Council has a high level of social media presence with considerable reach. There is a consideration of climate change in Council's posts which are focussed on awareness of climate-related hazards (i.e. heatwave) and Council's carbon emissions initiatives and targets and engagement for climate change community events. These results show that the City of Adelaide has actively communicated with the community about climate change issues. However, with such a large group of followers, there is an untapped potential for engagement which Council could utilise to improve community awareness on hazards and share information and build knowledge about climate change.

Table 6. Specific recommendations from the qualitative assessment.

Indicator	Recommendations
Climate Risk Assessments	<p>Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.</p> <p>Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.</p>
Climate Legal Risk	<p>Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.</p> <p>Ensure that legal risks associated with climate change are included in the risk register, until well managed.</p>
Staff Capacity and Resource Allocation	<p>Review opportunities to embed capacity building into existing staff training, such as new employee inductions.</p> <p>Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.</p>
Community/ Stakeholder Engagement	<p>Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.</p>
Institutional/ Intergovernmental Relationships	<p>Seek to clarify the role of Council as compared with the State Government about managing climate risk.</p> <p>Work with banks to better understand broader market risk and how they are considering the effects of climate change. It would be in the City's interest to identify how banks identify risk and what they see determines resilience at a City level. This may help City of Adelaide understand risk to rateable income due to property value risk. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.</p>
Climate Change Information	<p>Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.</p>
Information Systems	<p>Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.</p> <p>Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.</p> <p>Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.</p>

3 Physical risk assessment

The physical risk assessment considered the risk posed to the City of Adelaide's services, assets and infrastructure by a different future climate.

3.1 Method

The identification and evaluation of physical climate change risks and adaptation actions to the City of Adelaide was undertaken in accordance with AS5334-2013 *Climate change adaptation – a risk-based approach for settlements and infrastructure* and ISO31000:2018 *Risk management*.

3.1.1 Risk assessment approach

The approach is summarised in Figure 4, with the three key tasks highlighted as Tasks 1-3. These tasks were undertaken with key City of Adelaide stakeholders through one-on-one interviews. Interview participants are summarised in Appendix B.

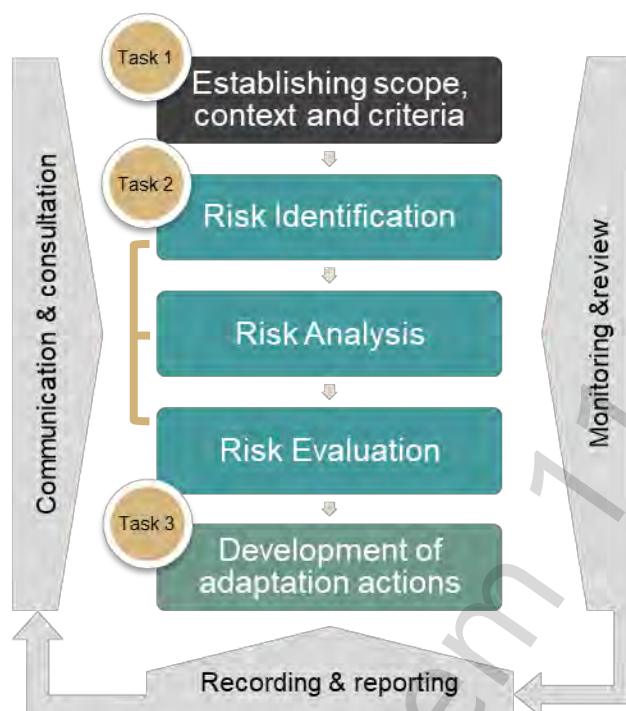


Figure 4. The climate risk assessment framework (adapted from ISO31000:2018).

Task 1: Establishing the context

The first stage of the risk assessment focussed on understanding the projected climate change impacts and their importance in the context of City of Adelaide to key asset stakeholders. The projected future climate context for 2030 and 2090 was summarised, using best available projections from the CSIRO Climate Change in Australia database and the Goyder Institute's Climate Change Projections for South Australia. These included future climate projections for temperature change, precipitation, drought, storms and other extreme climate events where relevant.

Task 2: Risk review, identification and evaluation

Aligning to the City of Adelaide risk management framework, this stage of the risk interview included:

- Review and updating of previously identified climate-related risks to specific City of Adelaide assets and service areas;

- Identification of any new or unforeseen direct and indirect climate-related risks associated with the City's operations or assets; and
- Evaluating climate related risks employing the City of Adelaide likelihood and consequence criteria to prioritise further management action.

Climate risks were identified and reviewed in the context of the projected changes to the regional climate for 2030 using the intermediate emissions scenario of RCP 4.5 and 2090 using the high emissions scenario RCP 8.5, considering any current controls or previously implemented mitigation actions.

Task 3: Development of adaptation actions

The third component of the risk assessment interview was the facilitated identification and/or development of adaptation options (i.e. risk mitigation actions) to manage the identified risks to an acceptable level. Adaptation options aimed to address all climate risk items identified as "medium", "high" and "extreme". Risks were then re-evaluated considering the adaptation actions.

3.1.2 Risk register development

After the risk assessment interviews, key findings were summarised in a climate change risk register aligning to the City of Adelaide risk assessment framework. Risk statements, control measures, risk ratings and adaptation actions were then reviewed by relevant Council staff to ensure accuracy.

3.2 Results

This section of the report summarises the key findings of the physical risk assessment. The full climate risk register has been provided in Excel format.

3.2.1 High level risk findings

Through the assessment, 283 individual risks to the City of Adelaide were identified. Over three quarters of the risks identified in this assessment were associated with the following climate variables:

- **Temperature:** including both average temperatures change as well as the increased frequency of very hot days and heatwaves; and
- **Rainfall:** including changing rainfall patterns, extreme rainfall and flooding events.

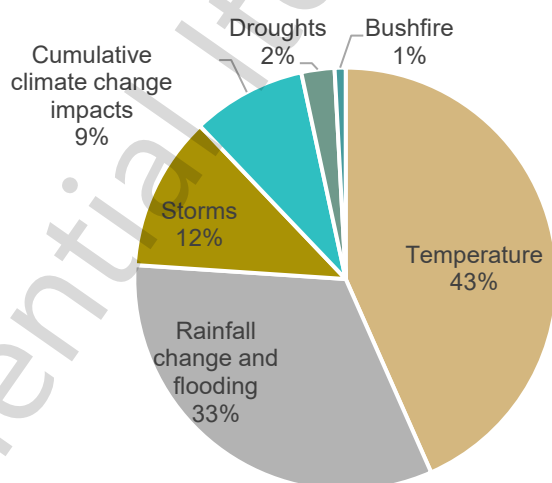


Figure 5. Proportion of climate risks by climate variable.

There were five extreme risks identified for the near future (2030) and 39 for the far future (2090), which is likely the result of increasing uncertainty and severity of climate change impacts into the far future. Importantly, many short term (2030) high risks may be relevant today and mitigation should be considered as a priority and addressed in an adaptation action plan. This effect is also visible with increased high risks in 2090 relative to 2030. The total number of risks and their ratings for each timescale are summarised in Figure 6 below. Residual risk ratings are also provided, demonstrating the potential implications of implementing the adaptation actions developed during the workshop process. With implementation of all proposed adaptation actions, it was assumed that:

- 90% of extreme risks (for 2090) could be addressed: and
- 49% of high risks could be addressed.

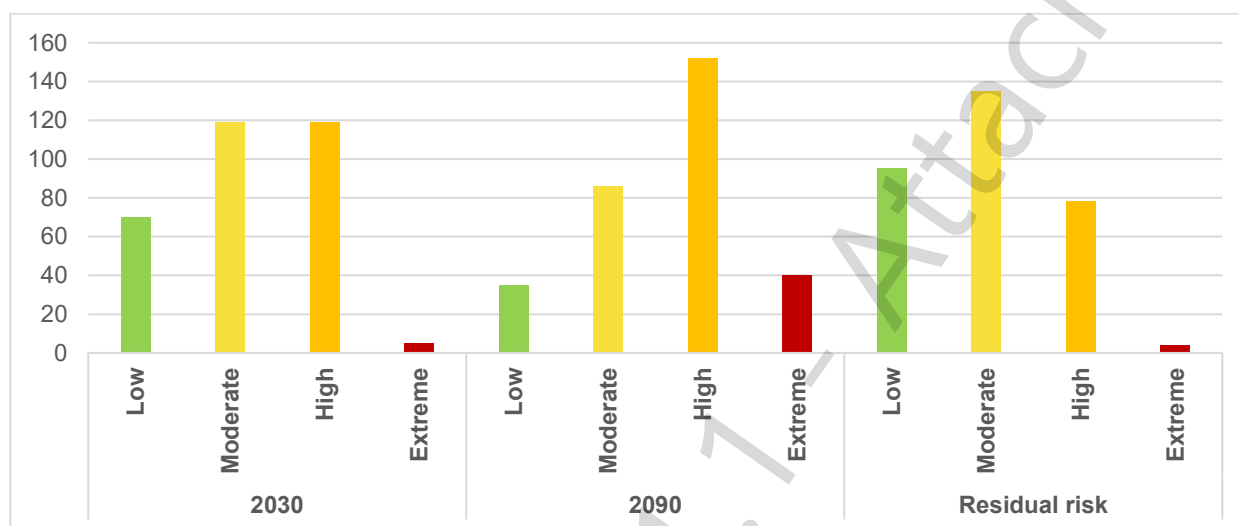


Figure 6. Total number of risks by time period and rating.

Extreme risks identified were associated with both cumulative climate change effects as well as acute climate change effects such as very hot days, heatwaves, flooding and hailstorms. A projected increase in the frequency of very hot days was the highest source of risk overall (77 risks for 2030), and it also had the highest number of significant (high and extreme) risks for both the near and far-future assessments (38 and 43 risks respectively). This was followed by the effects of heatwaves (59 risks in total) and flood-related impacts (57 risks). No risks associated with humidity changes were identified and reduced average annual and winter rainfall was the source of only two high risks. This follows an observed trend of a reduced number of priority risks being associated with chronic climate effects (such as gradual changes in temperatures and rainfall) compared to cumulative or acute impacts.

The number of risks, their ratings and timescales associated with the various climate change impacts are summarised in Table 7.

Table 7. Total number of risks by climate variable and rating across two timescales.

Climate Variable	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Increased average temperatures	4	10	4	0	2	6	10	0	18	77			
Increase in frequency of very hot days	17	22	38	0	6	18	43	10	77				
Increased duration of heatwaves	13	21	25	0	4	18	30	7	59				
Increased bushfire weather	0	3	0	0	0	1	2	0	3				
More frequent/severe droughts	0	6	3	0	0	3	6	0	9				
Changes to average humidity	0	0	0	0	0	0	0	0	0				
Reduced average annual rainfall	0	1	0	0	0	0	1	0	1				
Reduced average winter rainfall	0	1	0	0	0	0	1	0	1				
Increased intensity of hailstorms	2	4	1	0	2	0	4	1	7				
Increased extreme rainfall intensity and flooding	16	21	19	1	11	18	20	8	57				
Increased intensity of storm events and lightning	2	11	9	0	1	10	5	6	22				
Cumulative climate change impacts	6	11	12	4	1	10	14	8	33				
Increased intensity of extreme winds	5	4	4	0	4	1	8	0	13				

High level asset or service grouping findings included:

- Across City of Adelaide's operations, the asset or service area grouping with the highest number of individual risks was the Service Group (including services such as waste collection, cleaning, customer service, events and maintenance), with 117 individual risks, with one of these being extreme and 53 being evaluated as high for the near future
- Key Sites (which includes large assets such as Rundle Mall, Central Adelaide Market and the Aquatic Centre) with 104 risks in total, 32 of which were rated as high for the near future.
- Infrastructure (including bridges, roads, drainage and footpaths) was also a significant source of risk, with 60 risks in total. Four extreme and 22 high risks were identified that were associated with infrastructure.

Table 8 summarises the number of risks and their rating for each of the asset or service groupings.

Table 8. Total number of risks by asset or service grouping and risk rating across two timescales.

Asset or service grouping	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Service group	15	48	53	1	4	28	65	20	117				
Key sites	30	40	32	0	17	36	42	7	104				
Infrastructure	12	21	22	4	8	10	29	12	60				
Buildings	3	1	0	0	2	2	0	0	4				
Parkland and open space assets	0	4	4	0	0	4	3	1	8				
Other	5	1	1	0	0	5	2	0	7				
Total	65	115	112	5	31	85	141	40					

The following sections explore the climate related risks identified for each asset or service grouping in detail, focussing on high and extreme risks.

3.2.2 Key sites risk summary

This grouping covers City of Adelaide's important built assets, each of which provide the community with important social and economic infrastructure. These assets include the bus station, Adelaide Town Hall, Rundle Mall and several other iconic locations. As mentioned, the key sites group was associated with the highest total number of climate risks in this assessment, likely owing to the broad financial, economic and social role played by these assets in the community as well as increased interviewee representation.

No extreme risks were identified for the near future for these sites, however, nine were identified for the far future. Across all key sites, Adelaide Town Hall and UParks were identified as having the highest number of risks in total (16 and 17 risks each, respectively), followed by Rundle Mall, the Central Market and golf links. The number of risks and their ratings for the key sites group is summarised in the table below.

Table 9. Total number of risks for City of Adelaide's key sites.

Key sites	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Aquatic Centre	1	3	3	0	1	1	3	2	7				
Bus Station	5	0	0	0	5	0	0	0	5				
Community Centres	3	4	3	0	2	1	5	2	10				
Golf Links	0	7	5	0	0	7	5	0	12				
Town Hall	6	5	5	0	6	5	5	0	16				
Uparks	3	9	5	0	2	10	5	0	17				
Depot and Workshops	1	2	5	0	0	2	6	0	8				
Rundle Mall	5	5	3	0	0	5	7	1	13				
Adelaide Central Market	6	5	2	0	1	5	5	2	13				
Colonel Light Centre	0	0	1	0	0	0	1	0	1				
Total	30	40	32	0	17	36	42	7					

Aquatic Centre

Seven risks were identified at the Aquatic Centre, the most significant of which were related to the impacts of heatwaves and very hot days. Key risks included the health-related impacts of increased future temperatures on staff and patrons. This was of particular concern for the far future, where projections suggest more significant change and higher uncertainty.

Current controls to manage these risks for staff included provision of water, as well as demister fans and increased scheduled breaks during heatwave periods. Risks to the public were associated with increased future asset patronage and the increased need for visitors to wait in exposed areas to enter the facility. Proposed adaptation actions for this risk included the upgrade of facilities to reflect heat from external building surfaces as well as improving the asset's insulation, as well as to create more shade structures or to set up temporary shading on extreme heat days. These actions were deemed to reduce extreme risks to high and moderate ratings.

Flood related impacts were also identified as a high risk to the asset, related to the potential flooding of the site during extreme rainfall events and resultant need for facility closure and repair. This risk is currently managed given the recent upgrade of the drainage system, which should be investigated for capacity given the implications of climate change on rainfall intensity.

A summary of the key risks to the Aquatic Centre is provided in Table 10.

Table 10. Summary of high and extreme risks to the Aquatic Centre.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Staff exposed to artificially high temperatures in the centre for long periods of time	Staff health and safety compromised from being exposed to extreme heat conditions	Staff are provided with water. Demister fans Staff are given more breaks during these times	H	E	Upgrade facility to reflect heat from the external roof and walls Investment in building insulation.	H
Increase in frequency of very hot days	Increased community use of facility, people line up to enter the centre in the open.	Community exposed to heat whilst waiting to enter the facility	Staff monitor members of the public	H	E	Create shade structure outside or plant trees to shade customers. Set-up temporary fans or misting systems.	M
Increased extreme rainfall intensity and resultant flooding	Flooding as a result of extreme rainfall	Facility closure for repair and maintenance	Drainage system has been upgraded	H	H	Further drainage system upgrades	M

Bus Station

Physical climate related risks to the bus station related to flooding impacts on timetabling, heat related impacts on public health as well as increased maintenance and repair costs. All risks were considered low priority in this assessment.

Community Centres

Community centres were associated with a range of climate risks (nine in total), with all significant risks related to two linked hazards; increased temperatures leading to reduced thermal comfort in the community and the resultant increase in patronage of the centres, which would lead to resultant increased costs for cooling the assets. Extreme risks related to these hazards were identified under heatwave conditions, which highlights the increased likelihood of this occurring under scenarios with multiple hot days in a row. Current controls for these risks include ensuring that HVAC systems are operational and that energy efficiency measure are in place.

Addressing these risks through adaptation actions for the far future was associated with expanding current HVAC system capacity, extending operating hours to accommodate the increased demand from patrons, installing energy efficiency measures and potentially incorporating passive cooling design principles to reduce operational costs.

Priority risks to community centres are summarised in Table 11.

Table 11. Priority risks to community centres.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased number of people wanting to use the visitor centres as cool refuges	Increased energy costs for cooling	Energy efficiency measures	H	H	Energy efficiency measures Passive design measures in new builds	M
Increase in frequency of very hot days				M	H		M
Increased duration of heatwaves				H	E		H
Increased average temperatures	Increased temperatures reduce thermal comfort for general community	Increased number of people wanting to use community centres as heat refuges	Ensure that HVAC systems are operational	M	H	Provide additional cooling	M
Increase in frequency of very hot days				M	H	Use building design principles that optimise passive cooling Increased online services Extended operating hours	M
Increased duration of heatwaves				H	E	Backup storage in case of power failure	H

Golf Links

A total of 11 risks were identified at the Golf Links, all rated moderate to high. The high risks to this asset relate to a range of climate effects. Priority risks related to the increased frequency of very hot days were associated with reduced productivity, service delivery and employee health and safety. It was noted that on very hot days, staff cannot work on the green, leading to a build-up in the pipeline of scheduled works. A current control to manage this risk is to change schedules to focus on indoor tasks. It was suggested that to mitigate this risk in future, an increased automation of much of the green works would reduce the need for field staff to be working in exposed areas, thus reducing the risk to a low rating. It was also noted that the kitchen in one of the golf links assets significantly overheats on very hot days due to inadequate HVAC capacity. This risk has work, health and safety (WHS) implications and could be addressed through upgrading HVAC systems.

The increased intensity of storms was also noted as a key climate impact given the leaks in multiple buildings across Golf Links. Under climate change, these impacts would be exacerbated leading to increased maintenance and repair costs. It was proposed that upgrades to these assets could significantly reduce this risk into the future.

As temperatures rise, more water is required by the Golf Links infrastructure to ensure service delivery. This will lead to increased future water consumption and a greater environmental burden of

the asset. It was noted that alternate water sources are available and management strategies are in place to increase water use efficiency. Further water use reduction and efficiency measures were noted as potentially effective controls for this long-term, chronic risk.

Another priority risk to Golf Links is the impacts of droughts on the Torrens River (current Golf Links water supply) and the need to use alternate water sources which are of lower quality. The impacts of this shift are on the maintenance and repair costs, which increase due to the effects of high salinity and nutrient loads in alternate water source. Measures to address this risk in future include water capture and reuse expansion to address water use issues and demand management activities (irrigation) to reduce consumption and increase productivity.

Priority risks to the Golf Links are summarised in Table 12.

Table 12. Priority climate risks to Golf Links.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Hot days reducing ability for staff to work on green, causing delays in works and jamming up pipeline of works	Reduced productivity and service delivery	Changing schedules to focus on indoor activities	H	H	Increased automation of works to reduce need for ground staff in field	L
	Very hot days leading to overheating of kitchen space (low HVAC capacity)	Health and safety impacts for staff	WHS policies	H	H	Upgrade HVAC systems	L
Increased intensity of storm events and lightning	Buildings across golf links leaking during storm events	Increased maintenance and repair costs	Maintenance and repairs	H	H	Upgrade building assets to address leak issues	L
Increased average temperatures	Increased water use	Greater environmental burden	Alternate sources of water available. Management strategies are also in place to reduce water use	H	H	Water efficiency initiatives	M
More frequent & severe droughts	Prolonged drought reducing flows in Torrens and forcing change to lower quality (salinity and nutrient loads from the Gap) water source	Impacts on green quality, increasing maintenance costs	Changing water sources is simple however the reduced quality has impacts on the green fairway changes have been made to accommodate the reduced quality of the alternate water source.	H	H	Water capture and reuse expansion to address water use issues. Demand management activities (irrigation as opposed to manual watering) to reduce consumption and increase productivity.	H

Town Hall

Seventeen risks were identified for the Town Hall, with half of these related to temperature change effects including hot days and heatwaves. Floods were also identified as a key source of climate risk to this asset.

Hazards associated with very hot days included the inability to maintain thermal comfort for Town Hall patrons as well as the resultant increased wear and tear on HVAC systems. A recently installed chiller, as well as operational plans are in place to manage these risks, however, they are still considered high risks for both the near and far future. A proposed adaptation for these risks is to upgrade older chillers to improve HVAC capacity and efficiency.

Heatwaves were also a significant source of risk, both in terms of increased wear and tear (as above) and due to the increased likelihood of heatwave-related blackouts and their resultant impacts on Town Hall's operations. There are generators onsite to manage blackout situations however this was still considered an important risk given the projected impacts of climate change.

Bushfires were also cited as a high priority indirect risk to the Town Hall due to smoke ingress into the building envelope via the HVAC systems. This has been identified as an important risk across all buildings. No current control for this risk is in place.

The table below provides a summary of the priority risks to the Town Hall.

Table 13. Priority climate risks to the Adelaide Town Hall.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Inability to maintain thermal comfort evenly across Town Hall floors	health and safety impacts	One new chiller in place to manage hotter days. Cooling starts early during hot periods to manage heat impacts	H	H	Upgrade older chillers to improve HVAC efficiency and efficacy	M
	Increased wear and tear to HVAC systems	Increased maintenance costs	HVAC contractor maintains systems regularly	H	H	Accept risk	H
Increased duration of heatwaves	Increased energy demand from property for HVAC operation	Increasing operational costs	Energy efficiency measures	H	H	Energy efficiency measures	H
	Heatwave-related blackouts	Loss of critical infrastructure and resultant site closure	Two generators at Town Hall to cover critical infrastructure such as computer servers and other emergency assets. Emergency Management Plan in place to deal with blackout situations	H	H	Additional generators	H
Increased bushfire weather	Bushfire smoke ingress into assets	Service delivery impacts	No current management plan for this risk	M	H	Accept risk	H

UParks

UParks are an important source of revenue for the City of Adelaide and have a number of vulnerabilities to the impacts of climate change. Seventeen risks in total were identified and all significant risks were related to temperature-based impacts on site operations, costs and staff health and safety.

Three high risks were linked to the reduced ability of staff to service parking ticket boxes on very hot days, with consequences including reduced productivity, health and safety risks as well as reputational impacts associated with hot days leading to event cancellations. There are a range of current controls to address these risks, however it was still considered high for both the near and far future. Increased automation of parking facilities was identified as a potential approach to reduce the risk level across all consequence areas.

Hot days and heatwaves were also identified as being a source of risk to electrical components (the ticket machine in Central in particular) and chilled communications racks in parking buildings. The consequence of these risks included increased maintenance and repair costs. While the risk to chilled communications racks was accepted, it was identified that there is a need to upgrade the machine in Central to reduce overheating impacts.

Table 14 provides a summary of the priority risks to UParks.

Table 14. Priority climate risks to UParks.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Reduced ability for staff to service parking ticket boxes under very hot conditions	Reduced productivity and service delivery	In-car air con protects staff in transit and ice cold water is made available to all staff. Staff are then in mainly in undercover environments except parkland staff, where staff are swapped frequently on very hot days. Generators are used in some locations where power is not available to cool ticket boxes.	H	H	Increased automation to reduce need for attendance	M
		Health and safety risks to staff		H	H		M
		Increase event cancellation leading to revenue impacts		H	H		M
	Parking machine in Central overheating	Increased costs for maintenance	Maintenance and repair	H	H	Upgrade machine to reduce overheating impacts	M
Increased duration of heatwaves	Overheating of electrical components and chilled communication s racks in parking buildings	Increased maintenance and repair costs	Repair and maintenance	H	H	Accept risk	H

Depot and Workshops

Eight climate related risks were identified for the Depot and Workshops, mainly related to the physical implications of climate change effects on the asset leading to increase maintenance costs as well as productivity and health and safety impacts on employees.

Very hot days were identified as a priority risk given the potential for significantly increased internal temperatures leading to reduced staff productivity. Several current controls exist for this risk, however this is still considered a high risk for the near and far future. Heatwaves were also identified as a key source of risk due to the increased temperature of building materials leading to degradation and increased asset maintenance costs. Adaptation actions to address these risks include retrofitting shading structures to reduce build-up of heat in asset elements on very hot days.

Extreme winds and hailstorms were identified as key risk areas, related to direct damage to assets and resultant maintenance and repair costs. These high risks were considered manageable in future through ensuring buildings are well maintained and that inspections are increased before and after major wind events.

The capacity of the drainage system to cope with increasingly extreme rainfall events as well as the potential for hail to block drainage systems was also identified as a key risk area. Resultant flood related impacts were identified as significant in both the near and far future that could be treated through the incorporate of onsite retention and detention systems. Hail was also identified as a potential source of increased repair costs through direct damage to the workshop and depot assets.

Table 15 provides a summary of the priority risks to depot and workshop assets.

Table 15. Priority climate risks to depot and workshop.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperature of workshop and depot workspaces	Reduction in staff productivity	Buildings are insulated, staff can alter work hours to work in cooler parts of the day. Air conditioning installed in indoor spaces	H	H	Shading of workshop and depot through use of living and non-living shade structures Use of reflective roof surfaces and reflective pavement surfaces to reduce build up of heat	M
Increased duration of heatwaves	Increased temperature of workshop and depot workspaces	Accumulation of heat in building materials results in increased maintenance costs	Buildings are maintained as required	H	H	Invest in further insulation	L
Increased intensity of extreme winds	Increased force on building surfaces	Possible lifting of roofs, battering of cladding by winds	Buildings are maintained as required Loose items are locked down Buildings constructed to meet wind load requirements	H	H	Ensure buildings are well maintained Increase inspections before and after major wind events Accept risk of winds	H
Increased extreme rainfall intensity and	Greater amounts of water entering the stormwater and drainage	Overwhelmed stormwater system results in flooding	Stormwater system is designed for 1	H	H	Invest in onsite stormwater detention and retention	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
resultant flooding	systems during peak times of storms		in 100 year flood events			systems for overflow scenarios	
Increased intensity of hail storms	Hail blocks stormwater and roof drainage systems	Overwhelmed stormwater system results in flooding		H	H		M
	Increase in the amount of hail, size of hail stones	Damage caused to buildings as a result of impact	Buildings maintained as required	M	H		L

Rundle Mall

Thirteen risks were identified for Rundle Mall, with eight of these being considered significant in the long term. One extreme risk was identified for this asset (for the far future), related to the impacts of heatwaves on Rundle Mall patrons, leading to reduced sales for tenants. Provision of shade and water fountains was not considered adequate to manage this risk in the long term, therefore additional adaptation actions such as a shift trading hours to accommodate heat impacts, provision of continuous shade in the mall, changing the ground surface to cooler materials and increasing other cooling options were all identified to reduce the impacts of this risk.

Table 16 provides a summary of the priority risks to Rundle Mall.

Table 16. Priority climate change risks to Rundle Mall.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Reduce patronage of the mall over summer months	Reduced sales	Increased provision of HVAC, misters and cooling fans Drinking fountains Access to shade shelters	M	H	Shift trading hours Provide continuous shade in the mall Change ground surface to cooler materials	M
Increased bushfire weather	Greater smoke persisting in the city	Reduced sales	Health warnings regarding air quality	M	H	Accept the risk. No options available to clear smoke	H
Increased duration of heatwaves (very high confidence)	Increased risk of people experiencing heat stress or heat stroke in exposed areas of the mall	Increased emergency services call outs for shoppers and staff	Increased provision of HVAC Drinking fountains	H	H	Shift trading hours Provide continuous shade in the mall	M
		Reduced sales	Access to shade shelters	H	E	Change ground surface to	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		Liability risk caused by shoppers claiming that Council not providing safe facilities		M	H	cooler materials Increased cooling options	M
		Rundle Mall becomes less attractive as a shopping precinct compared with covered suburban shopping malls		M	H		M
	Heatwave-related blackouts	Reduced ability for shops to operate security and payment systems	Back up power for key buildings	H	H	Increased use of backup power systems	M
Increased extreme rainfall intensity and resultant flooding	Drainage systems overwhelmed	Increased flooding causing slip hazards for shoppers and staff	Provide signage to alert shoppers of risk areas Access to shelters from the rain	L	H	Increase capacity of drainage systems Invest in WSUD measures	M

Adelaide Central Market

There was a total of 11 climate related risks identified for Adelaide Central Market. Seven of these were identified as priority risks that should be addressed through adaptation actions.

All significant risks were associated with temperature change, with heat-related discomfort leading to reduced retail sales and associated reputational impacts due to tenant dissatisfaction. Also identified was the projected increase in energy consumption and associated costs due to increased requirements to cool the asset to achieve appropriate thermal comfort. These risks were rated high to extreme in the long term, and could be mitigated through adaptation actions such as increasing cooling and HVAC capacity, broadening night time shopping opportunities and implementing energy efficiency measures.

Table 17 provides a summary of the priority risks for the Adelaide Central Market.

Table 17. Priority climate change risks to Adelaide Central Market.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperatures reduce thermal comfort for shoppers and create risk of heat stress	Retail sales decline and food safety concerns	Onsite cooling systems Existing evening shopping hours	M	H	Increased cooling Additional night time shopping options	M
	Reduced ability of HVAC systems to maintain internal comfort	Reputational impacts due to dissatisfied tenants	Onsite cooling systems Existing evening shopping hours	H	E	Increased cooling Additional night time shopping options	M
	Increased energy demand from property	Increased energy costs	Managed through Council's power purchase agreement Installed solar PV helps to reduce power costs	M	H	Energy efficiency measures	L
Increased duration of heatwaves (very high confidence)	Increased temperatures reduce thermal comfort for shoppers and create risk of heat stress	Retail sales decline	Evening shopping hours Onsite cooling systems	M	H	Increased cooling Additional night time shopping options	M
	Reduced ability of HVAC systems to maintain internal comfort	Reputational impacts due to dissatisfied tenants	Evening shopping hours Onsite cooling systems	H	E	Increased cooling Additional night time shopping options	M
	Increased energy demand from property	Increased energy costs	Managed through Council's power purchase agreement Installed solar PV helps to reduce power costs	M	H	Energy efficiency measures	M
	Increased energy demand from property	Reduced ability to meet site energy reduction targets	Managed through Council's power purchase agreement for renewables	M	H	Energy efficiency measures	M

Colonel Light Centre

The Colonel Light Centre was identified as a high-risk asset to the effects of climate change related to the projected increased frequency of very hot days. It was noted that there is a current inability to maintain thermal comfort across the Centre, which will likely be exacerbated by future temperature increases. Addressing this risk is a short-term priority and could involve upgrading aging chillers in the centre and implementing measures to improve HVAC efficiency. The details of this risk are provided in Table 18.

Table 18. Priority risk to Colonel Light Centre

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Inability to maintain thermal comfort evenly across Colonel Light Centre	Reduced productivity	HVAC systems	H	H	Upgrade older chillers to improve HVAC efficiency and efficacy	M

3.2.3 Buildings

Three risks to buildings were identified however none of these were evaluated as priority risks in this assessment. Risks to specific assets across the City of Adelaide is covered in the Key sites section (See section 3.2.2 above).

3.2.4 Parkland and open space assets

The City of Adelaide maintains a wide range of parks and open space assets, which include green assets, streetscapes and trees. Several priority risks to these assets were identified, including the increased mortality of tree plantings on very hot days and resultant urban heat island implications, which was evaluated as an extreme risk for the far future. Other risks were associated with water-shortage based vegetation loss and the exposure of ground staff to extreme heat conditions. Although a range of current controls were documented, these were deemed inadequate to manage these risks in the short term.

Adaptation actions proposed included broadening the greening program to include more in-ground plantings that are supplied by urban runoff, increasing street tree irrigation to ensure plant survival on hot days and implementing temperature-related work thresholds to reduce heat-related exposure to Council staff. More details on the priority risks to parklands and open space assets are provided in the table below.

Table 19. Priority climate risks to parkland and open space assets

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Water shortage for greening in large proportion of parklands	Vegetation loss, increased heat, decreased human health and well-being	Research to demonstrate needs, and links to recycled water and implementation of WSUD	H	H	Need more rainfall permeability especially in CBD (e.g. permeable asphalt, paving, better rainwater harvesting).	H
Increase in frequency of very hot days	Plants become water stressed and heat burnt	Increased mortality of plantings (especially in unirrigated)	Replacement plantings and increased irrigation	H	E	Consider additional irrigation for irrigated parklands (e.g. incorporate WSUD and permeable paving) and	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		areas) and compromised tree condition leading to increased UHI effects especially in unirrigated areas				species selection for biodiversity plantings	
	Staff are exposed to extreme heat	Work schedules and activities are compromised	Start earlier in heat wave times - plan harder work for earlier in the day, do less strenuous work and choose more shaded locations where possible	H	H	Increased trees and irrigated green spaces will help to cool the city generally and provide more suitable working conditions	M
				H	H	Implement temperature threshold triggers above which staff works are permitted in shade/air conditioned locations only	H

Climate risks to crown land were all related to the impacts of droughts and very hot days on vegetation. This risk has cost, amenity and urban heat island implications for the City of Adelaide. Current controls are focussed on alternate water supplies in the Glenelg Adelaide Pipeline and irrigation, however, these risks were each considered high priority in the short term. Future adaptation actions proposed included investigation of broadening supply through rainwater capture and storage as well as conversion to artificial turf to reduce water consumption requirements and exposure to drought related impacts. More detail on priority risks to crown land is provided in Table 19.

Table 20. Priority climate risks to crown land.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
More frequent & severe droughts	Die off of green vegetation	Costly to maintain, limits use by people, decreased amenity, increased contribution to urban heat island	GAP (Glenelg Adelaide pipeline) works for the most part but is costly to maintain and does not cover the whole parklands	H	H	Investigate ways to capture and store rainfall on site Implement Water Sensitive City Plan	H
		Costly to maintain, limits use by people, decreased amenity, increased contribution to urban heat island	Irrigation of green spaces	H	H	Considering artificial turf but costly and has implications of urban heat and biodiversity and soil quality	H
Increase in frequency of very hot days		Costly to maintain, limits use by people, decreased amenity, increased contribution to urban heat island	GAP (Glenelg Adelaide pipeline) works for the most part but is costly to maintain and does not cover the whole parklands	H	H		H

3.2.5 Infrastructure

The City of Adelaide's infrastructure portfolio covers crucial urban elements such as roads, bridges, footpaths, kerbs and drainage. Given the often long-term design life of many of these assets, they can be particularly vulnerable to climate change impacts. Risks related to these elements are also frequently prioritised given their importance in modern society and very public nature. One extreme risk was identified to specific elements of the infrastructure asset portfolio for the short term, related to the stormwater and drainage network (see Table 21 below). This category was associated with eight extreme risks in the far future. Importantly, the IPWEA Asset Management and Financial Guidelines Practice Note 12.1 2018 is being employed by the infrastructure team to identify key risk areas and inform adaptation planning. This guidance document provides approaches for assessing and managing the impacts of climate change on the useful life of infrastructure.

Table 21. Total number of climate risks and ratings across City of Adelaide infrastructure assets.

Infrastructure elements	2030				2090				Total
	L	M	H	E	L	M	H	E	
Roads	0	0	7	0	0	0	7	0	7
Bridges	1	2	2	0	1	1	3	0	5
Footpaths	0	4	4	0	0	4	4	0	8
Kerb & Water Table	0	2	0	0	0	0	2	0	2
Stormwater Drainage Network	2	1	8	1	2	1	1	8	12
Traffic signals	0	5	0	0	0	0	5	0	5
Lighting and Electrical	5	0	0	0	5	0	0	0	5
Urban elements	4	7	1	0	0	4	7	1	12
Total	12	21	22	1	8	10	29	9	56

In addition to the risks to specific infrastructure elements, several other extreme risks were identified to the infrastructure management approach more broadly. These are summarised in the table below. These risks are all related to the cumulative effects of climate change over time and include:

- The lack of consideration of acute climate change effects in new asset design;
- The unknown actual and potential impacts of climate change across the existing asset portfolio; and
- A lack of data collection across infrastructure assets to understand and proactively manage climate related impacts.

These risks all have potentially significant cost implications for the near and far future – and the current reactive management approach was not deemed sufficient to ensure infrastructure asset portfolio resilience under the cumulative impacts of climate change. Several adaptation actions were identified to address these risks, including:

- Foster innovative thinking of team to develop policies and position of Council to support the consideration of climate impacts in new asset design and explore opportunities to learn and share across council business units.
- Development of targets into long term financial plans related to climate change resilience that translates to actions in asset management plans.
- Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be built out to manage key risks (e.g. catchment mapping to identify potential flood zones under climate change).

Table 22. High priority risks identified related to the broad infrastructure portfolio management approach.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Lack of consideration of climate change impacts in design and replacement across all infrastructure types (like for like replacement approach) - especially for large assets	Reduced service life and increased future replacement and maintenance costs	No controls identified	E	E	Foster innovative thinking of team to develop policies and position of Council to support this. Financial position of council will determine possibilities. Explore opportunities to learn and share across council business units.	H
Cumulative climate change impacts	Unknown impacts of climate change across existing infrastructure assets	Reduced service life and increased future maintenance and replacement costs	No controls identified	E	E	Set targets in long term financial plans related to climate change. Account for climate change related maintenance and upgrade costs in Long Term Financial Plan. Include climate risk in asset management plans (consider IPWEA Climate Change impacts on Useful life of infrastructure)	H
Cumulative climate change impacts	Lack of data collection to manage and identify climate related impacts	Potential cost implications	Current approach is responsive (based on events that occur rather than predictive maintenance programs).	E	E	Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be build (e.g. catchment map)	H

Roads

Road assets are particularly vulnerable to heat and rainfall related impacts on surfaces, reducing road design life and posing safety risks for road users. This assessment identified seven high risks (for both the near and far-future) related to these impacts, as well as reputational issues related to poor road quality. There is interaction between these risks, where the impacts of road damage from heat and extreme rainfall are exacerbated by heavy vehicles, leading to more rapid surface degradation. The reactive maintenance and repair approach currently employed was not deemed sufficient to manage these risks in the short term.

The key adaptation measure to address climate related hazards on road surfaces is the careful materials selection to accommodate increased surface temperatures and a more proactive and comprehensive maintenance program to address issues early. The details of each priority risk to roads identified is provided in the table below.

Table 23. Priority climate risks to road infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to road surfaces	Increased replacement and repair costs	Maintenance and repair	H	H	Materials selection to accommodate increased surface temperatures More proactive and comprehensive maintenance program to address issues early	M
	Flood and runoff related damage to road surfaces	Increased customer complaints and reduced reputation	Maintenance and repair	H	H		M
Increased duration of heatwaves	Heat related damage to road surfaces	increased replacement and repair costs	Reactive maintenance program for cracks and issues	H	H		M
		Increased accidents leading to health and safety impacts	Crack sealing using sealants	H	H		M
Increased extreme rainfall intensity and resultant flooding	Scour from heavy downpours exacerbating damage from very hot days	increased replacement and repair costs	Reactive maintenance program for cracks and issues	H	H		M
Increased duration of heatwaves	Buses and trucks impact road surface in very hot weather becomes bumpy, reduces surface life and making them more susceptible to further deterioration	increased replacement and repair costs	Maintenance and repair Crack sealing	H	H		M
		Road safety impacts	Maintenance and repair Crack sealing	H	H		M

Bridges

Bridges have climate related vulnerabilities in terms of surface related impacts (similar to those discussed above) as well as drainage. The two priority issues related to bridges were identified as increased costs from heat-related bridge deck damage, as well as the overwhelming of bridge drainage during flood events leading to road blockages and service delivery impacts. Current reactive maintenance programs were considered insufficient to manage these risks to an appropriate level – a more proactive approach to maintenance as well as exploring heat-resistant materials were identified as potential mitigation strategies. To address drainage issues, it was suggested that a review of drainage capacity of all bridge assets should be undertaken, followed by upgrades of hotspots to accommodate for increased rainfall intensity into the future. More detail on climate risks to bridge assets is provided in Table 24.

Table 24. Priority climate risks to bridge infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased heat-related damage to bridge surfaces	Increased maintenance and repair costs	Maintenance and repair	H	H	Proactive maintenance regime to address surface impacts explore opportunities for resealing bridges with more heat-resistant alternatives	M
Increased extreme rainfall intensity and resultant flooding	Bridge drainage overwhelmed during heavy rainfall	Blocking of road and resultant traffic impacts	Maintain drainage infrastructure	H	H	Review drainage capacity of all bridge assets and upgrade hotspots to accommodate for increased rainfall intensity	M

Footpaths

Climate related impacts to footpath assets are also related to the impacts of extreme rainfall increases as well as high temperatures and heatwaves. Consequence areas for these risks included cost impacts, reputation and complaints as well as health and safety issues to members of the public. Risks related to surface damage from heatwaves and flooding are currently managed through a reactive maintenance and repair program – this approach was not considered sufficient to effectively manage these risks under a changing climate (refer to Table 25 below). The adaptation action proposed aligns with other infrastructure asset adaptation suggestions and focuses on a shift to a more proactive maintenance program to reduce these issues. Another suggestion (related to direct heat-related damage) was to increase shading of footpaths to reduce these impacts and provide a more comfortable and safe experience for users.

Table 25. Priority climate risks to footpath infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to footpath surfaces	increased replacement and repair costs	Maintenance and repair	H	H	Proactive maintenance and repair of assets	L
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to footpath surfaces	Increased customer complaints and reduced reputation	Maintenance and repair	H	H		L
Increased duration of heatwaves	Heat related damage to footpath surfaces	Increased trips and falls leading to health and safety impacts	Maintenance and repair	H	H		L
Increase in frequency of very hot days	Road and footpath damage	Costly to fix or upgrade	Investigating potential cool seals for road surfaces	H	H	Change materials used and design of surfaces. Plant more trees to help with shading	H

Kerb and water table

Two climate related risks were identified to these elements, each with high priority ratings for the far future. Reduced average rainfall was identified as potentially reducing the local water table, which would have potentially costly structural implications for surface assets due to soil shifts. In addition, increased rainfall intensity was identified as a source of cost impacts to kerb infrastructure, which would require increased repair under these conditions. As above, the current maintenance approach was not deemed sufficient, highlighting the need for a more proactive approach. More detail on these risks is provided in the table below.

Table 26. Priority climate risks to kerb and water table infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Reduced average annual rainfall	Reduced water table	Shifts in soil leading to structural damage to surface assets leading to increased repair costs	Maintenance and repair	M	H	Proactive maintenance regime	M
Increased extreme rainfall intensity and resultant flooding	Increased wear and tear on kerb assets	Increased repair and maintenance costs	Maintenance and repair	M	H	Proactive maintenance regime	M

Stormwater drainage network

The City of Adelaide stormwater network was associated with 12 climate-related risks, eight of which were rated as extreme in the long term. The stormwater network was associated with the highest number of extreme risks in any category and is therefore of significant concern. It was also noted through a number of interviews that flooding and stormwater capacity issues are known as the most important climate impact across infrastructure assets. All risks identified were related to the increased projected intensity of rainfall and storms, leading to a range of hazards including:

- Extreme rainfall and runoff overloading the stormwater system, which is mostly designed for 1 in 10-year storm events. In addition, much of the stormwater infrastructure is at or approaching end of life.
- Gross pollutant traps becoming blocked by debris leading to localised flooding.
- Drainage infrastructure overload due to increased water use and disposal across the City.

Key sites associated with flooding impacts across the network included:

- North Adelaide; and
- Hutt St and South Terrace in Southern Adelaide.

There were a range of current controls documented to manage flooding, however, the reactive maintenance program makes the city more vulnerable to these impacts. There are no major upgrades of the system underway currently and the gross pollutant traps are under a winter maintenance program.

The adaptation initiatives identified to manage key risks to the stormwater network centred around the development of a whole of city stormwater modelling project, including climate change projections for increased rainfall intensity, would identify key vulnerabilities and help plan for greater system capacity. The outcomes of this assessment could then be used to inform upgrade initiatives at key hotspots across the network that respond to the projected effects of climate change.

More detail on risks to the stormwater network and their adaptation actions is provided in Table 27.

Table 27. Priority climate risks to stormwater and drainage infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of storm events and lightning	Rainfall and runoff overloading CoA stormwater system, which is mostly designed for a 1 in 10 storm event.	Flooding of roadways leading to reputational impacts	No major upgrades currently underway - maintenance is reactive. Key sites include: - North Adelaide - Hutt St and South Terrace in Southern Adelaide	H	E	Whole of city stormwater modelling project (incl. climate change projections for increased rainfall intensity) to identify vulnerabilities and plan for increased capacity.	M
		Flooding of private property and safety impacts		H	E		M
		Flooding and increased damage costs		H	E		H
Increased extreme rainfall intensity and resultant flooding (high confidence)	Flooding across LGA is most important climate impact currently - for infrastructure	Increased complaints	Reactive management approach to flooding issues - much infrastructure is at end of life	H	E	Upgrade stormwater network to accommodate effects of climate change	H
	Flooding across LGA is most important climate impact currently - for infrastructure	Increased repair and maintenance costs	Reactive management approach to flooding issues - much infrastructure is at end of life	E	E		H
	Gross pollutant traps blocked by debris	Flooding of parks and roads - resulting in damage to assets and infrastructure	Maintenance schedule during winter; weather monitoring	H	E	Redesign gross pollutant traps to get them out from bridges	M
	Gross pollutant traps blocked by debris	Flooding of parks and roads unless cleared by maintenance staff - risk to staff if needs to happen during flooding		H	E		H
	Gross pollutant traps blocked by debris	Flooding of parks and roads preventing access and use		H	E		M
Cumulative climate change impacts	Infrastructure overload	Infrastructure failure	Stormwater catchment drainage plans, regional catchment flood mitigation projects and engineered solutions	H	H	Need more greening and WSUD across the city, need to advocate for SA Water to install infrastructure to allow for wider use of recycled water in buildings.	H

Traffic signals

Traffic signals are important elements of street infrastructure and are vulnerable to the effects of extreme weather events. This risk assessment identified five priority risks, all rated high for the far future. All risks were related to failure of these assets and the resultant loss of service and health and safety implications. Climate impacts included heatwave related blackouts, extreme wind and flood damage to elements of traffic signals. Currently, signal failure requires traffic police to maintain traffic flow and reactive maintenance of drainage infrastructure is undertaken to reduce flooding impacts. The following adaptation actions were identified to address these risks:

- Backup power supply to signals in key areas; and
- Proactive asset management plan to identify issues early and reduce climate-related wear and tear that could compromise their functionality.

The table below summarises key climate related risks and adaptation actions to traffic signals.

Table 28. Priority climate risks to traffic signal infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Heatwave related blackouts leading to signal failure	Increased traffic incidents and resultant reputational impacts	Traffic police maintain traffic flow	M	H	Backup power supply to signals in key areas	L
Increased intensity of extreme winds	Wind-related damage to traffic signal assets	Increased maintenance and repair costs	Traffic police maintain traffic flow	M	H	Proactive asset management plan to identify issues early	L
Increased extreme rainfall intensity and resultant flooding	Flood or extreme rainfall related damage to traffic signal infrastructure	Increased maintenance and repair costs	Maintain drainage infrastructure	M	H	Develop pro-active maintenance regime for infrastructure assets	L
	Failure of rail / road interface cabling during flood events	Transport delays and resident frustration	Maintain drainage infrastructure	M	H		
Increase in frequency of very hot days	Failure of rail / road interface cabling during flood events	increase maintenance and repair costs	Maintain drainage infrastructure	M	H	develop pro-active maintenance regime for infrastructure assets	L

Lighting and electrical

No significant risks were identified in relation to street lighting and other electrical components. Identified risks were related to extreme heat impacts on electrical components and their increased deterioration or failure. Flood and wind-related impacts were focussed on direct impacts on lighting and electrical components. All risks to these assets were related to increased maintenance and repair costs. Suggested adaptation actions to manage these risks were to select more robust materials that could withstand higher temperatures or wind gusts. Flood-affected assets could be relocated where possible, based on the outcomes of the required stormwater study.

Urban elements

Urban elements in this assessment include public events infrastructure, waste infrastructure (such as bins), recreation equipment areas and public furniture. A total of 13 risks were identified in this infrastructure asset category, with 8 of these being considered high priority. One extreme risk was identified (for the far future), relating to the potential health and safety implications of severe storms on public outdoor events. The proposed adaptation for this extreme risk was to review existing storm management plans to ensure this accounts for the increased intensity of storm events in the future. Another event-related risk was identified, related to the reduced ability to hold daytime events in summer periods due to very hot days. Responses to this risk may include a shift towards indoor events during hot periods.

Additional high risks were linked to storm-related damage to waste infrastructure and flood related damage to recreational assets. These risks could be addressed through a shift to a proactive maintenance regime to identify issues early.

Table 29. Priority climate risks to urban element infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of storm events and lightning	Storm impacts on public events infrastructure	Health and safety risks at outdoor events	Maintenance and repair	H	E	Review and implement storm management plan for increased storm intensity for future events	M
Increase in frequency of very hot days	Increased difficulty of holding public events due to extreme weather	Reduced ability to hold daytime events due to heat related health and safety impacts	Extend hours of operation Providing onsite cooling facilities and water stations	M	M	Shift to indoor event or increase safety precautions for outdoor events	L
Increased intensity of extreme winds	High winds damaging waste infrastructure	Increased streetscape pollution and litter	Maintenance and repair	M	M	Develop proactive maintenance regime for infrastructure assets	M
		Increased maintenance and repair costs		M	M		M
		Increased litter leading to increased need for litter collection services		M	M		M
Increased duration of heatwaves	Increased smells associated with waste infrastructure	Increased collection rates and associated costs	Accept risk	M	M	Develop proactive maintenance regime for infrastructure assets	M
Increased extreme rainfall intensity and resultant flooding	Flood related damage to recreational areas	Increased repair and maintenance costs	Maintain drainage infrastructure	M	M		M
Increase in frequency of very hot days	Increase in solar radiation during hot day	UV damage to public furniture requiring more maintenance	Material selection	M	M		M

3.2.6 Other

The Other asset group includes plant and equipment and other elements that are out of the scope of this assessment. One priority risk to this category was identified, relating to the impacts of hot days on the City of Adelaide vehicle fleet. These are stored outside when not in use and are therefore vulnerable to degradation due to heat impacts. No suggested adaptation action was identified for this risk.

3.2.7 Services

The services category covers a range of the service areas offered by the City of Adelaide and was also identified as having the highest number of individual risks across all groups, with 106 risks in total. Planning and building, library services and visitor information were identified as the categories with the highest number of climate risks (refer to Table 30 below). Extreme risks for the short term were identified for street and toilet cleaning services, community gardens as well as visitor information.

Table 30. Summary of number of climate risks and ratings across City of Adelaide services.

Component	2030				2090				Total
	L	M	H	E	L	M	H	E	
City Safety	0	3	1	0	0	2	2	0	4
Cleansing (streets, toilets)	0	0	8	0	0	0	8	0	8
CoA Events	0	3	5	0	0	0	4	4	8
Community Grants	0	1	4	0	0	1	1	3	5
Community Gardens	0	8	0	0	0	0	8	0	8
Community Programs	0	2	3	0	0	0	4	1	5
Customer Service	0	3	0	0	0	0	3	0	3
Finance and Procurement	1	6	4	0	1	1	8	1	11
Homeless Support	1	0	4	0	0	1	0	4	5
Horticulture	0	1	3	0	0	1	1	2	4
Information Management	0	2	2	0	0	2	2	0	4
Library Services	0	3	8	0	0	2	7	2	11
Maintenance	0	1	3	0	0	1	3	0	4
People (HR)	0	4	4	0	0	0	8	0	8
Planning and building	3	9	4	1	2	8	4	3	17
Visitor Information	14	0	0	0	0	11	3	0	14
Waste Collection	1	0	0	0	1	0	0	0	1
Total	20	46	53	1	4	30	66	20	120

This section will discuss the priority climate related risks to the broad range of services offered by the City of Adelaide.

City safety

City safety has an important role to ensure the safety of resident and visitors to the City of Adelaide. Several priority climate risks were identified, with the majority being related to the impacts of increased temperatures on the level of visitation of the city. It was noted that increased average temperatures would bring additional people, highlighting the potential implications of a slight warming of the climate. Consequences of this risk included potential health and safety impacts due to inadequate resourcing. A key adaptation action related to this risk is additional resources to support the safety team.

An additional risk was identified that was related to heatwave impacts on staff health and safety, which could be mitigated through the expansion of the current approach to reallocate resources during hot spells. More detail on climate risks to the City safety team are summarised in the table below.

Table 31. Priority climate risks to the city safety service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased public activity in the city	Current resources spread thin leading to potential increase in health and safety impacts during heatwaves	Work schedules are altered at certain times of the year	M	H	Additional resources sought to support more team	M
Increased duration of heatwaves	Exposure of staff to extreme weather	Decreased workload and risk to staff health	Outdoor staff are reallocated work that minimises outdoor exposure	H	H	Outdoor staff reallocated to other jobs that don not require exposure to extreme heat	M

Cleansing (streets, toilets)

A range of climate related risks were identified to the cleansing services team and operations. Projected wind intensity increases were associated with the increased spread of pollen and dust, leading to both an increased need for street cleaning services as well as asthma related health and safety impacts for staff members. Additional priority risks were also identified in relation to increased temperatures and its effect on staff health and safety when undertaking work outdoors. The control measure for this risk was associated with an additional cascading risk related to an inability to adequately deliver services due to increased heat-related working restrictions. No adaptation actions were identified through the stakeholder interviews.

More detail on climate risks to the cleansing team are summarised in the table below.

Table 32. Priority climate risks to the cleansing service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of extreme winds	Increased spread of dust and pollen (northerly winds)	Increased frequency of street, footpath and public realm required	None identified	H	H	Accept risk	H
	Increased spread of dust and pollen (northerly winds)	Increased risk of asthma, hay fever and other respiratory illnesses	Staff wear P2 masks and other PPE	H	H	Accept risk	H
Increase in frequency of very hot days	Risk to outdoor staff health and safety	Staff are reallocated to indoor duties and staff hours are altered to work in the cooler parts of the day	Staff start earlier or undertake work indoors and only respond to high priority outdoor tasks	H	H	Accept risk	H
	Reduced ability to clean the public realm, due to restrictions of staff working in	Loss of cleansing of public realm, more dust, pollen, leaves, litter in the public realm.	Staff start earlier or undertake work indoors and only respond to high priority outdoor tasks, however, staff	H	H	Accept risk	H

	outdoor environments		are limited in their work hours due to noise restrictions set by the EPA.			
--	----------------------	--	---	--	--	--

Events

Major events at the city of Adelaide are frequently outdoors and are therefore more susceptible to climate related impacts. Heat related impacts are of key concern due to the direct impacts on patron comfort and safety. Very hot days were associated with potentially reduced patronage at outdoor events, as well as the reduced use of public transport to access events. These risks were rated as extreme for the far future, and adaptation actions to address these included:

- Create artificially cool spaces for events;
- Continue to prioritise greenspace due to the thermal properties of greenspace compared to paved surfaces;
- Utilise misting systems and create shade areas to reduce heat exposure;
- Continue investment into Urban Heat Island (UHI) mitigation strategies;
- Create cool corridors around public transport hubs to encourage people to utilise public transport; and
- Use indoor spaces for events more frequently.

Increased hail and storm intensity was also identified as a source of significant risk, linked to reduced desire for patrons to attend events as well as direct health and safety impacts. The key opportunity to reduce the exposure of events to storm impacts is a shift towards more indoor events, especially in the far future.

More detail on climate risks to Council events are summarised in the table below.

Table 33. Priority climate risks to the Council events service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Unpleasant for people to be outdoors	Reduction in the number of people visiting events during very hot days	Events are planned during the evening, night time and early in the morning where possible.	H	E	Create artificially cool spaces for events.	M
	Unpleasant for people to be outdoors	Reduction of people travelling to events via public transport on very hot days	Events are shaded through the use of the parklands, marquees, indoor spaces	H	E	Create cool corridors around public transport hubs to encourage people to utilise public transport	H
Increased intensity of hail storms	Unpleasant for people to be outdoors	A reduction of people in the city and loss of spending in local businesses	Increased use of indoor spaces and semi permanent weather proof outdoor spaces	M	E	Increase options for rental of indoor spaces and protected outdoor spaces	L
	Hail damage	Increased danger to people	None	M	H	Increase use of indoor spaces and protected outdoor spaces	L

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flooding of event spaces	A reduction of people in the city and loss of spending in local businesses	Planning, risk assessment	M	H	Increase use of indoor spaces and protected outdoor spaces	M
Increased intensity of storm events and lightning	Danger to people in outdoor spaces	Risk of lightning strike	Planning, risk assessment	H	E	Increased use of indoor spaces	L
Increased intensity of extreme winds	Not suitable for marquees or other temporary structures	Reduction in people's perception of safety	Planning, risk assessment	H	H	Increased use of indoor spaces	L
Increased duration of heatwaves	Build up of heat due to the UHI effect	Reduction in people visiting the city due to a reduction in comfort from heat	Events planned at times of reduced heat i.e. mornings, evenings, night. Indoor events	H	H	Increased use of indoor spaces	L

Community Grants

The City of Adelaide community grants provide funding for worthy causes across the community. A key concern identified through this risk assessment was the increased demand for funding from community organisations addressing homelessness. It was identified that a range of climate impacts may lead to this hazard, including heatwaves, flooding and storms. The key consequence of this hazard is the reduced ability to fund other programs due the dramatic potential increase in demand from this community sector. No specific adaptation measures to address this issue were identified, however, the interviewee highlighted the complexity of the issue and the likely need for further research in the space.

An additional priority risk to the community grants program was related to the loss of Council funded events due to their increased exposure to climate related effects. A key adaptation action for this risk was the encouragement of flexibility around the timing and location of events to reduce this exposure and the resultant health and safety risks.

More detail on climate risks to community grants are summarised in the table below.

Table 34. Priority climate risks to the community grants service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Reallocation of funds towards programs, rather than events that may be affected by severe heat	Loss of CoA funded community events	Events must meet stipulations to minimise risk of cancellation as a result of weather	H	H	Encourage/stipulate use of indoor spaces for outdoor events or only early morning, evening and night events	M
Increased duration of heatwaves	Increased demand for funding from community based organisations addressing homelessness	Increased reliance on limited resource funding, increased risk for vulnerable communities, reduced ability to fund other less needed community programs	A focus on increased shaded areas, continued greening of spaces to cool local environment, research into the adoption of high heat reflecting surfaces	H	E	<i>Requires further research and understanding, beyond the scope of this analysis</i>	E
Increased extreme rainfall intensity and resultant flooding				H	E		E
Increased intensity of storm events and lightning				H	E		E

Community Gardens

Community gardens play an important role in the community, and due to their susceptibility to climate related effects, a range of climate risks were identified. A key climate related impact was the loss of plant life in gardens due to increasingly severe hot days and heatwaves. This was also considered a potential loss of support for the community gardens. Heat related impacts could be mitigated through the careful selection of species as well as changing planting patterns to suit the changing climate. Also identified was the opportunity to capture and use rainfall to reduce the garden's reliance on mains water. Watering schedules may also be updated to account for severe heatwaves or hot days to reduce garden impacts.

An additional risk area identified was the cumulative impacts of climate change leading to a lack of suitability of some plants to the Adelaide context. This was outlined as a moderate risk in the short term, with a long-term requirement to adapt the planting schedule to the changing climate.

More detail on climate risks to community gardens are summarised in the table below.

Table 35. Priority climate risks to the community gardens service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Plants die from heat	Plants require protection from the sun via shade	Planting or heat tolerant species, increased watering	M	H	Choose heat tolerant species to plant over the warmer months, plant seasonal food plants over the cooler months.	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Plants require more water to survive hot days	More water used for irrigation purposes	Planting or heat tolerant species, increased watering	M	H	Capture rainfall locally for use over summer to reduce reliance on mains/GAP water. Water more frequently prior to a heat wave, late in the evening. Invest in shade structures to reduce direct sunlight	L
Increased duration of heatwaves	Reduced ability of community to maintain plants in extreme heat conditions	Plants may die or reduce vigour	Planting or heat tolerant species, installation of automatic watering system	M	H	None required	M
Increased extreme rainfall intensity and resultant flooding	Increased hail storms	Hail damage to produce and plants	Some gardens are shaded and protected to some degree	M	H	Installation of shade cloth where necessary. Accept the risk. Replant where necessary	H
Cumulative climate change impacts	Alteration of traditional weather patterns	Plants that once grew well in the Adelaide climate, now are not suitable for the new climate	None	M	H	Seek hardier plants, originating from climates that resemble the new climate	H
Cumulative climate change impacts	Gardening becomes undesirable due to altered weather	Loss of community support for community gardens	Community education and engagement programs exist in the community. There are indoor spaces for community to meet	M	H	Create partially shaded environments for gardening and organise times to avoid heat of the day or extreme weather events	L
More frequent & severe droughts	Reduced soil moisture	Increased watering demand throughout the year	Gardens receive watering via a dripper system	M	H	Choose some hardy and drought tolerant plant species. Capture	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Reduced average winter rainfall (high confidence)	Reduced soil moisture	Increased watering demand through winter	Gardens receive watering via a dripper system	M	H	stormwater via rainwater tanks Utilise wicking beds and other systems for drought scenarios	L

Community Programs

There were diverse and significant risks related to community programs, including one extreme long-term risk related to the business continuity impacts of cumulative climate change effects. It was noted that local businesses have poor adaptive capacity to respond to temperature change and their resultant impacts on customer behaviour. An adaptation action to increase business and community training and awareness in this space was identified as potentially reducing this risk.

In addition, hot days and heatwaves were also associated with impacts to local amenity and visitation. It was acknowledged that the City of Adelaide has a focus on urban cooling strategies currently, however, these risks were still identified as being of high priority.

Flood related impacts on outdoor community programs were also identified as a high risk given the potential for loss of some outdoor spaces during these periods.

More detail on climate risks to community programs are summarised in the table below.

Table 36. Priority climate risks to the community programs service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Threat to outdoor based community programs	Loss of community use of outdoor spaces	Risk matrix and assessment consider extreme weather in relation planning	H	H	Accept risk	H
Increase in frequency of very hot days	Loss of use and amenity of council assets. Heat will negatively influence resident and visitor behaviour and people will not utilise council assets during hot spells	Reduction in well-being of the community, restricted exercise times, people forced indoors more often and for longer periods of time	Council has a focus on urban cooling strategies through the sustainability team	M	H	Accept risk	H
Increased duration of heatwaves	Threats to events in the summer period	Tourism events may need to be moved to night time events or to another time	Council has a focus on urban cooling strategies through the	M	H	Accept risk	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		of year so they will still attract visitors.	sustainability team				
Increased extreme rainfall intensity and resultant flooding	Threat to outdoor based community programs	Loss of community use of outdoor spaces	Risk matrix and assessment consider extreme weather in relation planning	H	H	Accept risk	H
Cumulative climate change impacts	Threat to business continuity. Many businesses do not have business continuity plans and are not prepared to adapt to conditions associated with climate change	Loss of business in the CoA area as businesses have poor adaptive capacity to respond to increased average temperatures and altered consumer behaviour arising from increased temperatures	Disaster Resilience Officer employed by CoA to help educate and upskill residents and businesses in adapting to climate change and other disasters	H	E	Increased community and business training in tandem with peak business bodies, such as Business SA, East Adelaide traders etc.	H

Customer Service

Several climate risks to the customer service team were identified. These were all associated with the cumulative change in climate and included:

- Increased need to reimburse money due to event cancellation;
- Inadequate resourcing to manage the shift towards social media and call centres due to diverse climate impacts; and
- Increases in infringement notice disputes, leading to increased community and staff stress.

Several current controls exist for these risks however each was considered of high priority in the long term. Proposed adaptation actions to manage these impacts were associated with the need for consistent approaches and messaging to make staff actions and decisions more clear. This could be achieved using decision trees or checklists and a CRM system.

More detail on climate risks to customer service are summarised in the table below

Finance and Procurement

Six priority climate risks were identified for the City of Adelaide's Finance and procurement team, with one extreme risks identified for the far future. The most important risk identified was related to the cumulative impacts of climate change and that, across the organisation, Council may be unprepared for the long-term implications of climate change, many of which may be identified through this risk assessment. It was noted that many of the policies' stated adaptation and mitigation strategies had not yet been tested – and that undertaking tests for their efficacy would support improved policy and initiative development to better protect Council operations and assets against the diverse and complex risks associated with climate change.

Table 37 - Priority climate risks to the customer service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Events/activities cancelled in very hot or poor weather situations	Need to reimburse monies	Payment plans in place where needed	M	H	Accept risk	H
Cumulative climate change impacts	Increased demand on social media platforms and call centres	Current staff inadequately resourced	Flexibility in staff responsibilities - able to move staff from less demand areas to higher demand areas	M	H	Need consistent approach and messaging through Council - and consistent templates and thresholds/triggers identified.	H
Cumulative climate change impacts	Infringement disputes increase	People are more unhappy; staff under stress	Payment plans available; business continuity plan now in place (since COVID19); authorities to wave expiations if needed; monitoring of demand/dispute numbers to be able to forecast response need	M	H	Decision support-tree/matrix applied council wide to identify what action to take and when Internal checklists to ensure all information if provided to all relevant staff	H

Cumulative climate impacts and their potential link to increased disease pandemics was also identified as a potential risk area, especially in light of the effects of the recent COVID-19 outbreak. The ability for Council to seek payment for fines and infringements from residents was identified as a potential issue during these periods, when broader economic implications are taking place that might increase the negative perception of Council. A strategy to mitigate this risk was the potential suspension of expiations during times of social and economic stress. This may also be applied in the context of widespread impacts from extreme weather events such as storms or bushfires that impact upon the community.

Additional risks related to the damage to Council assets (including heritage buildings) were also identified, linked to the impacts of heatwaves, floods and storms. The Finance and Procurement team have a role to support increased resilience in assets through the procurement process. It was noted that the current procurement policy has a focus on sourcing suppliers from ethical and environmentally responsible suppliers, which includes sourcing products and services that help council respond to the impacts of climate change.

More detail on climate risks to Finance and Procurement are summarised in the table below.

Table 38. Priority climate risks to the finance and procurement service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Increased disease pandemics	Increased negative perception by public	None	H	H	Establish protocols for suspending expiations during times of extreme financial and social stress.	M
More frequent & severe droughts	Reduced available water for council plants	Increased water demand to supply sufficient water for plants		M	H	Forecasting predicted climate change predictions to plan for increased costs of watering	M
Increased intensity of hailstorms	Increased maintenance of council managed buildings	Damage to assets as a result of poor hail resistance of building materials	Certifications of businesses, policies, foot printing are reviewed as part of the procurement process. This includes sourcing products and services that help council respond to the impacts of climate change.	M	H	Accept risk	H
Increased intensity of storm events and lightning	Increased maintenance of council managed infrastructure	Damage to assets as a result of poor flood mitigation measures	Council are assessing the predicted impacts on infrastructure in the CoA area.	M	H	Accept risk	H
Increased duration of heatwaves	Increased maintenance of council managed infrastructure	Increased frequency of maintenance and repair of council heritage listed assets associated with increased heat	Procurement team are working closely with the Asset and Property Team in council to assess the impacts climate change will have on council.	H	H	Accept risk	H
Cumulative climate change impacts	The cumulative effects of climate change	Council may be unprepared for the long-term	Council have not tested many of the adaptation and	H	E	Testing of plans and policies to assess their efficacy	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
	haven't been assessed	implications of climate change	mitigation strategies that are proposed in their policies				

Homeless Support

Homeless support services identified a range of extreme rated climate risks for the far future, all related to the effects of increased hot days and heatwaves on the homeless population. Importantly, the effects of climate change in the City of Adelaide region may drive increased homelessness in the future. Heatwaves and hot days were identified as driving increased requirements for emergency services for the homeless as well as heatwave related blackouts reducing the ability of the homeless to access information via the internet at community health centres. Current controls to mitigate these risks include:

- Provision of additional water for primary homeless people;
- Collaboration with other homeless services;
- Communications about how to prepare for hot weather; and
- Increased monitoring of people in distress.

Additional actions that may be implemented to further address these risks to the homeless population include a range of initiatives such as:

- Free swim and locker passes at swimming pools;
- Complementary movie passes noting that cinemas have cooling; and
- Afterhours cool places program.

More detail on climate risks to Finance and Procurement are summarised in the table below.

Table 39. Priority climate risks to the Homeless Support service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperatures reduce thermal comfort for the homeless and creates risk of heat stress	Increased number of health and safety emergencies for the homeless	Provision of additional water for primary homeless people	H	E	Free swim and locker passes at swimming pools Complementary movie passes noting that cinemas have cooling Afterhours cool places program	M
	Extreme heat-related blackouts at community centres	Homeless people are unable to access information via the internet at community centres which may relate to their individual health and well being	Communications about how to prepare for hot weather Increased monitoring of people in distress Collaboration with other homeless services;	H	E		M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Increased temperatures reduces thermal comfort for the homeless and creates risk of heat stress	Increased number of health and safety emergencies for the homeless		H	E		M
	Heatwave-related blackouts at community centres	Homeless people are unable to access information via the internet at community centres which may relate to their individual health and well being		H	E		M

Horticulture

Given the significant implications of climate change on green infrastructure, the Horticulture service area was associated with several important climate related risks. The increased projected frequency of very hot days was identified as a key concern to both plants and animals across the Council area. Tree and plant deaths were associated with increased costs to irrigate and maintain parkland spaces for public amenity. The expectation by the community of parkland to be green all year is currently supported by the use of 750 megalitres of water for irrigation per year. An adaptation measure to broaden the water supply was to further invest in water sensitive drainage systems to allow for capture and storage of stormwater for irrigation purposes.

The increased projected intensity of rainfall was also identified as a key risk to the Horticulture service area due to the impacts of flooding in parklands and properties across the LGA. Currently, some water sensitive design elements are reducing peak flows, however expansion of these assets was identified as a key adaptation strategy to reduce the impacts of this risk.

More detail on climate risks to the Horticulture service area are summarised in the table below.

Table 40. Priority climate risks to the Horticulture service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Heat stressed plants (trees, groundcover, bushes)	Increased use and therefore costs of GAP irrigation water and mains supply water to reduce heat stress	Community expects the parklands and parks to be green all year. This requires significant (750,000 megalitres) of water.	H	E	Invest in further WSUD elements to capture and store stormwater. Shandy stormwater with GAP water to reduce reliance of mains supply water. Implement water	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
						sensitive city plan.	
Increase in frequency of very hot days	Heat stressed animals (Grey-Headed Flying Fox)	Death of animals that can spread disease, animals die in places where they can be accessed by the public, children etc	Education sessions around Grey-Headed Flying Foxes	H	H	Signage and locations are continually upgraded with information and warnings	M
Increased extreme rainfall intensity and resultant flooding	Limited capacity to store stormwater or reduce impacts of flooding on parklands and properties within the CoA	Increased flooding of parklands and properties within the CoA	Some WSUD elements in the CoA area help to reduce peak stormwater flows	H	E	Upgrade of the stormwater network to incorporate further WSUD elements to store greater amounts of stormwater and respond to peak flows water. Implement water sensitive city plan.	L

Information Management

The Information Management service area identified two priority climate risks, each rated high for the near future. In relation to the cumulative impacts of a changing climate, it was noted that information on changes or processes is not currently consistently communicated (both internally and externally). The effects of climate change may exacerbate this issue, leading to confusion amongst staff and mixed messages being provided to public leading to public dissonance. Currently, the Customer Service team employs templates for communications, however it was identified that there is a need for a consistent approach and messaging through Council, with consistent templates and thresholds/triggers identified. Other initiatives to support clearer communications include:

- Decision support-tree/matrix applied council wide to identify what action to take and when; and
- Internal checklists to ensure all information is provided to all relevant staff.

Another key vulnerability for the information management team was the heatwave-related failure of HVAC systems that maintain current data centres. It was noted that there are three air conditioning units in place to manage very hot days, but this is inadequate given likely increases in length and severity of heatwaves into the future. Approximately 50% of data is in the cloud, which significantly reduces Council's vulnerability to this risk. Further adaptation to address this risk could be achieved through increasing the shift to cloud computing to reduce need for onsite datacentres and relocates the issue to the datacentre service provider.

More detail on climate risks to Information Management are summarised in the table below.

Table 41. Priority climate risks to the Information Management service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Information on changes or processes not consistently communicated (internally and externally)	Confusion amongst staff and mixed messages being provided to public leading to public dissonance	There are some templates used by customer service team	H	H	Need consistent approach and messaging through Council and consistent templates and thresholds triggers identified.	L
Increased duration of heatwaves	Heatwaves leading to failure of datacentre HVAC systems and resultant damage to data centre infrastructure and productivity	Increased maintenance and repair costs	Three aircon units in place to manage very hot days. 50% of data is in cloud, which significantly reduces Council's vulnerability to this risk.	H	H	Shift to cloud computing reduces need for onsite datacentres and relocates the issue to the datacentre service provider. Asset Management team is responsible for HVAC provision.	L

Library Services

Library services are vulnerable to a range of climate risks, related both to the operation of the library asset as well as impacts on community behaviour and preference. Very hot days and storm impacts in the future were associated with the following effects:

- Library event cancellation;
- Staff health and safety risks in outdoor activities;
- Reduced visitation of the city; and
- Overall reduced vibrancy of the city due to these impacts.

Current management approaches to these issues is centred around the Hot Weather Policy that aims to reduce staff exposure and a range of adaptation responses such as shade provision and drinking water. Remote access to reduce the need for travel was also identified as an opportunity to reduce risk. A continued shift toward moving events to cooler part of the day as well as the provision of cooling infrastructure such as shading was identified as suitable adaptation actions to further address these risks.

Heatwaves were identified as having an implication for the library assets themselves, leading to greater strain on HVAC systems to provide thermal comfort and to issues with internal lift infrastructure. This is a key concern as libraries are deliberately open on days of extreme weather as a safe and comfortable place for the community, so need to be operational. Proactive repair and upgrades of HVAC and lift systems was identified as a key risk mitigation opportunity to ensure a safe and comfortable space as demand for library services increases into the future.

More detail on climate risks to Library Services are summarised in the table below.

Table 42. Priority climate risks to the Library Services area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Library promotional activities and services at outdoor events are compromised	Staff do not attend outdoor events. Events may be cancelled.	Hot weather policy dictates allowance for staff exposure to heat and adaptation response, such as shade, drinking water availability etc	H	H	Events may occur in cooler parts of the day. Contingencies may be put in place - shade, drinking water, outdoor fans.	M
	Staff health and safety	Reduced ability for library staff to promote services to the community in the outdoors. i.e. in Rundle Mall	Hot weather policy	H	H	Accept risk	H
	Public less likely to visit events during this time	Reduction of people visiting the CoA, loss of spending in the city	Host events in indoor spaces, at night or utilise shaded outdoor spaces. Some events are live streamed through the internet.	H	H	Events are planned for evenings and nighttime periods or early morning over summer.	M
	Events are cancelled	Reduced city vibrancy and loss of attraction	Some events are live streamed through the internet. More events planned for cooler months instead of over summer.	H	E	Accept risk	E
Increased duration of heatwaves	Strain on air-conditioning service. Air-conditioner has not operated properly on hot days	Reduced thermal comfort of staff and public in the libraries	Libraries are deliberately open on days of extreme weather as a safe and comfortable place for all of the community. Repair of air-conditioning	H	H	Increased servicing of air-conditioners or upgrade of air-conditioning	M
	Increased temperatures inside buildings	Failure of equipment. For example, lifts often break-down in hot weather. May impact on visitor enjoyment of indoor event spaces.	Lifts are serviced as needed	M	H	Accept risk	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Public less likely to visit events during this time	Reduction of people visiting the CoA, loss of spending in the city	Events hosted indoors	H	E	Create large sheltered spaces within the public realm to allow for mass public events, that will not be disturbed by storm events	H
Increased intensity of storm events and lightning	Library promotional activities and services at outdoor events are compromised	Staff do not attend outdoor events. Events may be cancelled.	Staff abide by weather policy, that covers risk of storms and lightning	H	H	Events are planned for indoor spaces. Events require shelters	M
	Public less likely to visit events during this time	Reduced revenue for CoA businesses	Live streaming of events. Use of indoor spaces for events	H	H	Accept risk	H

Maintenance

The Maintenance Service area was associated with two priority climate risks. Flooding was identified as an important impact area for the stormwater network (explored in more detail in Section 3.2.5). Damage to this infrastructure was identified as a key issue and it was noted that upgrades to this infrastructure and to encouraging building owners to install water tanks could address these risks through reducing peak flows. The second priority risk was related to very hot days, and their impacts on energy demand for cooling work areas. Current controls were not deemed effective at controlling this risk, suggesting the need for adaptation actions in the form of increased building insulation and passive cooling design elements to reduce energy demands. These risks are described in detail in the table below.

Table 43. Priority climate risks to the Maintenance Services area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Limited capacity of the stormwater network to cope with increased high intensity rainfall events	Damage to infrastructure as a result of flooding	Some WSUD elements in the CoA area help to reduce peak stormwater flows Emergency response to flooding events	H	H	Upgrade stormwater network to increase the capacity for peak flows. Invest in more permeable pavement footpath options. Incentivise building owners to install water tanks.	H
Increase in frequency of very hot days	The temperature inside work buildings increases as a result of outside temperatures	Increased energy demand and associated costs	Investment in PV panel, purchase of green energy	H	H	Increased investment in insulation, passive design elements	H

Planning and building

The planning and building service area is concerned with planning and approvals for developments across the Council area. Key climate risks related to this services area were related to the cumulative

physical impacts of climate change leading to reputational, health and safety and financial implications for Council. Three key hazards relating to these were identified:

- Current DPTI Guidelines are not considered suitable for ensuring resilience to a changing climate, leading to increased potential issues for community members due to increased climate impacts;
- The building code does not meet best practice for resilient building; and
- Developments undertaken on Council land may not meet future resilience requirements which may lead to retrofit and repair requirements.

These issues were all rated as high to extreme for the near and far future as current controls were not deemed sufficient to meet these emerging challenges. Adaptation actions to address these issues included:

- Further the influence of CoA on DPTI planning requirements to be more proactive in resilient building practices; and
- Ensure that large developments on Council land meet resilience requirements for future climate.

Other climate risks were linked to potential delays in the undertaking of inspections due to hot weather. Currently, Council has restrictions on maximum temperatures under which staff can work outdoors to reduce health risks. In future, Council may consider expanding the range of times during which compliance assessments are undertaken or to advocate for changes in how assessments are undertaken to reduce delays in the development approval process.

Climate risks to Planning and Building are summarised in the table below.

Table 44. Priority climate risks to the Planning and Building area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Current DPTI Guidelines not suitable for ensuring resilience to changing climate, leading to increased issues for community members due to increased climate impacts	Reputational impacts	Planning team currently trying to influence DPTI through submission on planning and design for better resilience and sustainability outcomes.	H	H	Further influence on planning requirements Develop more specific, draft state planning policies document.	H
	Reliance on building code for resilience to future climate change does not meet best practice for resilient building	Impacts to community health and safety		E	E	Further influence on planning requirements	M
	Developments undertaken on Council land not meeting future resilience requirements, leading to need for retrofit and repair	Increased maintenance and repair costs		H	E	Ensure developments on Council land meet resilience requirements for future climate	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased daytime temperatures reducing the hours per day that compliance officers can conduct assessments	Delays in building inspections	Council restrictions on maximum temperatures under which staff can work outdoors	M	H	Expand range of times during which compliance assessments are undertaken	L
Increase in frequency of very hot days	Increased daytime temperatures reducing the hours per day that compliance officers can conduct assessments	Delays in building inspections		M	H	Advocate for changes in how assessments are undertaken	M

Visitor Information

Priority climate risks related to the Visitor Information services team were both related to the potential increase in demand for use of the centres as cool refuges. This would have cost implications for Council in terms of maintaining thermal comfort in the space. Current controls were deemed adequate for the short term, however in the long term it was suggested that the following adaptation actions be implemented:

- Building design principles that optimise passive cooling; and
- Adopt energy efficiency measures.

Table 45. Priority risks to Visitor Information services.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased number of people wanting to use the visitor centres as cool refuges	Increased energy costs for cooling	Council has a power purchase agreement which determines energy costs Invest in energy efficiency measures	L	H	Use building design principles that optimise passive cooling	L
Increased duration of heatwaves				L	H	Adopt energy efficiency measures	L

Waste Collection

There were no priority risks associated with City of Adelaide's waste collection services.

4 Transition risk and opportunity materiality assessment

The transition risk assessment considered the risks and opportunities posed to the City of Adelaide's services, assets and infrastructure by a transition to a low carbon economy.

4.1 Overview

Given uncertainties around future carbon emissions reductions, it is becoming increasingly important for organisations to prepare for a range of climate change futures to promote resilience, including addressing risks from physical climate change, as well as from the social and economic transition to low carbon economies. Increasingly ambitious carbon reduction targets require equally ambitious mitigation strategies, which may have diverse implications for organisations and society. This links closely with the goals of the Carbon Neutral Adelaide initiative, which aims to make Adelaide the world's first carbon neutral city. Many initiatives and strategies will need to be employed to drive the required reductions in carbon emissions.

Potential risks resulting from the transition to a low carbon economy may include those associated with shifts in the following areas:

- Policy;
- Regulation;
- Technology;
- Markets and business models; and
- Reputation and confidence.

Beyond the physical risks explored in Section 3 of this report, these may have important implications for the City of Adelaide's operations that should be considered in resilience planning.

The key aim of the transition risk assessment was to identify and prioritise climate transition risks and opportunities relevant to the City of Adelaide.

4.2 Method

The methodology employed to undertake this assessment aligns with key guidelines such as those described in the Financial Stability Board's Taskforce for Climate-related Financial Disclosures (TCFD). The key steps of the method are summarised in Figure 7 below.



Figure 7 - Summary of the transition risk and opportunity materiality assessment process.

Task 1: Selecting future scenarios

The first stage of the assessment was to identify and adopt internationally recognised scenarios and their characteristics to inform the future characteristics of a global low-carbon future. This helps to define a future by which to identify transition risks and opportunities. A range of scenarios have been developed that make complex assumptions about future economic, demographic and physical environmental characteristics. Low-carbon future scenarios typically suggest a rapid reduction in global carbon emissions in line with the Paris Agreement, achieving global net zero emissions by the 2060s. The scenarios selected for this assessment included

- Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) 2.6 (Meinshausen, Smith, & Calvin, 2011); and
- International Energy Agency (IEA) Sustainable Development Scenario (IEA, 2020).

Along with demographic and economic assumptions, these scenarios include assumptions around a range of metrics that inform global policy initiatives, energy sources that are associated with dramatic reductions in carbon emissions. Key elements defined in low-emissions scenarios through this assessment included:

- Global energy mix;
- Carbon pricing through time;
- Transportation changes and electrification; and
- Built environment energy efficiencies.

Assumptions of these scenarios are global, and do not define the potential future characteristics at the country scale.

Task 2: Define local parameters

This stage of the assessment aimed to employ the low emissions scenarios described above and develop an application of these scenarios in the Australian context. The following documents were employed to inform this element of the project:

- Corporate TCFD disclosures e.g. (Colonial First State, 2020) (CBA, 2019); and
- Local think tanks e.g. (Beyond Zero Emissions, 2010).

Information from these documents was used to inform a picture of aggressive carbon emissions reduction in Australia.

Task 3: Workshop risks and opportunities

Information developed through tasks 1 and 2 above was summarised in a series of slides and presented to a range of City of Adelaide stakeholders (attendees provided in Appendix C). Following the presentation, a workshop was facilitated to identify the potential implications of a global low-carbon trajectory on the operations of the City of Adelaide. A preliminary set of risks and opportunities related to the key transition themes was discussed with participants, leading to the development of a shortlist of key issues to be discussed in further detail.

Task 4: Evaluate and document findings

Following the workshop, a register of risks and opportunities was developed and shared with participants for review and refinement. The basis for ratings is summarised in Table 46. The register includes a materiality rating for each risk and opportunity, which was employed to prioritise the findings of the assessment, as well as potential treatment actions to mitigate the risk. Materiality ratings were developed and scored in consultation with City of Adelaide stakeholders. The Transition Risk and Opportunity Register is provided in a separate spreadsheet provided to Council.

4.3 Results summary

The assessment covered transition issues across broad themes related to a rapidly decarbonised economy. This section highlights the key findings of the assessment, summarising the priority (high and extreme) risks and opportunities identified in this materiality assessment.

4.3.1 Risks

A total of 32 transition risks to the City of Adelaide were identified through the workshop, covering specific Council assets, business units and risks to Council's operational goals and community.

Priority risks to the City of Adelaide, which are those with high materiality, are summarised below.

Table 46. Description of the materiality of risks and opportunities used for the transition assessment.

Rating	Risk description	Opportunity description	Timeframe for action
Low	Low priority risk with immaterial impact on Adelaide operations. BAU approach will manage risk implications.	Low priority opportunity with immaterial impact on Adelaide operations.	20 – 50 years (long)
Moderate	Moderate priority risk with lower probability of detrimental implications to operations. City of Adelaide to consider what can be done to manage risk implications in the medium term.	Moderate priority opportunity with lower probability of positive implications to operations. City of Adelaide to consider opportunity in the medium term.	10-20 years (medium)
High	High priority risk with significant detrimental operational implications. City of Adelaide to consider ways to eliminate or reduce exposure to High risks in short term.	High priority risk with significant beneficial operational implications. City of Adelaide to explore implementation of opportunity in short term.	5 – 10 years (short_)
Extreme	Extreme priority risk with immediate or potential future harmful impacts to operations. City of Adelaide to eliminate risk or prioritise adaptation actions to manage impacts in immediate term.	Extreme priority opportunity with immediate or potential future benefits to operations. City of Adelaide to explore in immediate term.	0 - 5 years (immediate)

Aquatic centre and gas utilities

The City of Adelaide Aquatic Centre was associated with one high materiality transition risk related to the gas-powered heating of the pool infrastructure. The use of gas is the second highest source of carbon emissions for the City of Adelaide, and the Aquatic Centre is the highest gas user across the City of Adelaide portfolio. The Aquatic Centre is vulnerable to the introduction of a carbon emissions tax scheme, which would dramatically increase its operational costs given its comparatively large carbon footprint.

A potential treatment action for this high-risk asset is the development of a gas transition or exit strategy to reduce the reliance on gas for energy, building resilience to carbon emissions pricing initiatives in Australia.

Business model

The City of Adelaide business model is vulnerable to the impacts of changing markets away from tourism and the international student market. It was identified that climate-related market changes in travel could drive the need for shifts in the city's revenue model. While this indirect risk is not within the City's direct control, there are opportunities for the city to support the diversification of less carbon intensive revenue generation in the region.

Fleet vehicles

A key risk area in the materiality assessment was the identification of the vulnerability of the City of Adelaide's large vehicle fleet to carbon emissions trading schemes. This includes heavy as well as light vehicles from across the City's operations. Putting a price on carbon would likely devalue high emissions vehicles, with potentially significant implications given fleet vehicles are an important component of the City of Adelaide's asset portfolio.

Carbon management and procurement

Stakeholders identified an extreme materiality risk through the workshop related to the range of carbon management initiatives being undertaken at the City of Adelaide that hinder a more integrated approach. It was noted that a procurement policy including climate risk and emissions mitigation has been drafted, but further improvements could be made to better integrate emissions reduction initiatives with resilience and risk planning.

Planning

The transition to a low-carbon economy may have significant implications for the City of Adelaide's planning team. Importantly, the recently released Draft State Planning Policies will inform development of the policies contained in the future Planning and Design Code. State Planning Policy 5 requires developers to "minimise the adverse effect of decisions made under the Act on climate change and promoting development that is resilient to climate change". This policy highlights a current trend towards increased sustainability performance of the build environment. Two priority risks were identified in relation to increasingly stringent planning and development requirements:

- Reputation risks related to the current planning code and how it is being applied. This includes the implications of a reported lack of enforcement of code requirements, leading to lower carbon performance developments.
- Resourcing risks related to the need to upskill team members to accommodate and enforce policy changes that drive increasingly stringent carbon performance of new buildings.

Property

Given the City of Adelaide's large property portfolio, shifts in building performance requirements as well as the development of a carbon price may lead to several important transition impacts related to operational and capital costs, as well as asset value. The potential need to retrofit large and important sites (e.g. Central Market) for improved energy efficiency would require significant capital investment and was identified as a high materiality risk. Currently, some existing energy efficiency and upgrade programs are in place (e.g. Central Market upgrade of evaporative cooling system), but these would need to be expanded to address this issue. Treatment risk mitigation actions identified including the development of new requirements to seek Green Star ratings to reduce exposure to this risk.

In addition to cost increases, it was also identified that some assets would be devalued if their carbon efficiency was not improved through the retrofit actions described above. This would have broader financial implications on Council's ability to raise capital.

UPark Adelaide

UPark Adelaide is an important Council revenue stream associated with the provision of carparks across the Council area for public use. A high materiality transition risk associated with UParks was the societal transition towards increased public transport usage leading to significant impacts on UPark revenues. In the extreme, these assets may become stranded assets. Suggested treatment actions included the development of regular strategic property reviews to reduce portfolio exposure and inform asset disposal or upgrades where required.

Waste services

Waste collection and management is an important aspect of the City of Adelaide's service delivery. Through the workshop the exposure of the waste sector to carbon pricing is a material risk to the City of Adelaide, given the likely cost implications on the waste sector. Further, initiatives to increase recycling across the state may also be a risk given the reliance on rate payment to achieve waste outcomes. A key risk treatment would be the increasing of rates to cover costs, which may lead to other reputational impacts for Council. In addition, the Strategic Waste Management Plan (currently in development) is an opportunity to strengthen internal operations and waste management programs, linking to Carbon Neutral Adelaide Actions 4.1.1, 4.1.3 and 4.4.1).

4.3.2 Opportunities

Fourteen transition opportunities were identified through the stakeholder workshop. These related to proactive responses to risks to create opportunities for innovation, improved service delivery and increased resilience of the Council to a shift towards a low-carbon economy.

The following priority opportunities were identified through the assessment:

- **Utilities and solar energy:** A key opportunity in relation to energy is the development of shared solar and demand management initiatives with Flow Power. Proactive development of community-led solar generation may increase the resilience of the City and residents to changes in carbon pricing and energy intensity.
- **Property portfolio:** A range of high priority opportunities for transition resilience across the City of Adelaide property portfolio were identified. These included:
 - The development and management of micro generation networks on council assets. This could represent a shift in Council's role to facilitate a more distributed energy model. This initiative also links with the Carbon Neutral Adelaide action 1.2.3 – to facilitate and case manage decentralised energy generation within significant development sites.
 - Installation and roll out of batteries for buildings to drive localised energy models. The current trial at London Road Depot represents a case study for this initiative, and Council should investigate opportunities to install energy storage systems when it is cost-effective to do so. Consideration should be given to the current retail electricity contract and the potential implications of electric vehicles as mobile batteries.
 - There are a range of opportunities to mitigate potential tenancy revenue risks through the provision of highly energy efficient tenancies that are attractive to changing market demand. Under a low-carbon future, it is anticipated that customers will seek increasingly sustainable tenancies to save costs and reduce organisational carbon emissions. This opportunity links with the Carbon Neutral Adelaide action 1.5.5 – to strengthen leasing policies to include consideration of leading industry standards such as Green Star Office Interiors; NABERS Office Water and Waste and emerging carbon neutral standards.
- **Climate leadership:** Given the City of Adelaide's current progress and goals towards zero carbon, there is a clear opportunity for the city to capitalise on this current progress to export sustainability knowledge and initiatives into the Australian marketplace. Several initiatives, including webinars and industry engagement sessions, have already made progress however further development to support a business-led climate network was identified. The demonstration of leadership towards the low-carbon transition was a key priority in this assessment. By becoming carbon ready, adapting early to key transition risks and achieving carbon neutrality goals, the City of Adelaide could further cement its reputation in this space. Future opportunities include the promotion of Adelaide as a zero-carbon destination for more sustainable local and interstate tourism.

5 Key findings

5.1 Climate change governance

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

5.2 Physical risk

The assessment identified 283 individual physical risks for the City of Adelaide based on independent assessment by the project team and review and refinement of the results by Council staff. Over three quarters of the risks identified in the assessment were associated with hot weather and rainfall, either the broader drying trend projected for Adelaide or the potential for more intense periods of rainfall leading to flooding.

Key risks related to the broad themes identified for this assessment by Council include the following:

- Key sites - The key sites that are considered to be at greatest risk are the Aquatic Centre, Community Centres, Rundle Mall and the Adelaide Central Market. None of these had extreme risks for 2030, but all had a combination of high and extreme risks by 2090.
- Crown land – While limited risks were identified, the major concern for Crown Land was the impact of drought and hot weather on the viability of green infrastructure into the future. This was rated as being at high risk even with adaptation measures taken into consideration.
- Buildings - Three risks to buildings were identified, however, none of these were evaluated as priority risks in this assessment. Risks to specific assets across the City of Adelaide are covered in the Key sites section.
- Parkland and open space assets - Several priority risks to these assets were identified, including the increased mortality of tree plantings on very hot days and resultant urban heat island implications, which was evaluated as an extreme risk for the far future.
- Infrastructure - One extreme risk was identified for the short term, related to the stormwater and drainage network. This category was associated with eight extreme risks in 2090. Roads were also associated with high risks at 2030 and 2090.
- Service - The services category had the highest number of individual risks across all groups, with 106 risks in total. High and extreme risks at 2030 and 2090 were common for cleansing (streets, toilets), events, community grants, homeless support, library services, horticulture, planning and building.

In summary, the risks common across all categories were:

- Impacts of heat on people and the ability to deliver Council services, the desire for people to come to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.
- Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, streetscapes, Crown Land or the golf links.
- Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.

As indicated in the governance assessment, it is important that risks are publicly disclosed in order to have effective climate change governance. The results of this risk assessment provide Council with the information need to update its corporate risk register, other corporate governance documents, and to produce a public facing summary of climate change risks.

It is common practice to ensure that extreme and high risks can have their residual risk rating reduced to moderate or lower once adaptation measures are implemented. Based on the adaptation measures identified during this risk assessment, this is possible for some but not all risks. Council needs to determine whether further identification of adaptation measures is required or whether it is willing to accept high risks in some instances.

The adaptation measures identified in this assessment should be used to develop an adaptation plan. There are two key factors to consider in this regard. First, is the "lifetime" of relevant decisions. This concept is explained in Stafford Smith et al. (2011), and suggests that for every decision there is a lead time and consequence time. Decisions with a long lifetime (e.g. over 50 years) such as building bridges, drainage and other infrastructure need to account for the long term effects of climate change in their design because even if this infrastructure is built now, it will need to continue to function under a different future climate in the latter part of the century. Second, is the timing of adaptation, noting that not all actions need to be implemented immediately, instead some adaptation measures can be implemented in the short term and others in the decades to come. This is the key underlying principle of an adaptation pathways approach.

Liability Risk

One of the five consequence areas considered in the physical risk assessment was "liability" risk. It is important to note that the risks identified as a "liability" risk in the risk assessment are general in nature. The risks have not been identified by a legal professional and are based on general liabilities that have been discussed in the literature, media and general conversations that the team had with Council staff and other local governments throughout Australia. In many cases the likelihood or consequence have not been determined as it has been deemed that further legal analysis is warranted. It should also be noted that it is reasonable to assume that any of the risks identified in the risk assessment that have a potential impact on health and safety have a heightened risk of legal risk (including risks of criminal charges).

As noted by Bell-James, Baker-Jones, & Barton (2017), when reviewing liability risks it is prudent to note that the relevant risks to local governments may materialise through the following areas:

- Administrative Law;
- Failure to adequately embed climate change into development plans;
- The release of hazard information (e.g. incorrect information);
- Not having adequate risk information; and
- Withholding hazard information.

Given the complex nature and broad range of potential legal risk associated with climate change it is difficult to assign likelihoods or possibilities as per a traditional risk management approach. Instead it is prudent that all risks and risk management options be assessed by in-house and/or independent legal professionals.

According to legal climate risk expert Mark Baker-Jones (Baker-Jones, 2014), councils are facing an increasing exposure to climate legal risk. Baker-Jones states that:

The primary concern for those charged with land use planning and development of infrastructure lies with decision making – how those assets are dealt with and how they are planned, managed and operated in light of the physical impacts. Local governments, and those involved in the development of long term infrastructure in particular, need to be able to make informed decisions about how to deal with the impacts of climate change if they are to avoid litigation.

Informed decision-making includes ensuring that governance mechanisms are designed to manage emerging risk, that risk assessments are updated on a regular basis and that councils ensure that decisions and advice come from suitably qualified people (council staff and external consultants).

As noted by Professor Justine Bell (Bell-James, 2017) councils should seek legal advice early for climate-related risks. She notes that nature of legal risk can be long-term. 'This means that councils should have a well-thought out policy that will help to back up their decisions and avoid ad hoc judgements. Ideally, any decisions will be backed by science and engineering.'

5.3 Transition risk

The transition risk assessment identified a range of important risks and opportunities related to a low-carbon economy transition. The assessment revealed a number of priority areas that should be brought into focus to increase the City of Adelaide's resilience to a range of climate futures as follows:

- Car parking - A high materiality transition risk associated with UParks was the societal transition towards increased public transport usage leading to significant impacts on UPark revenues. In the extreme, these assets may become stranded assets.
- Business model - Climate-related market changes in travel could drive the need for shifts in the city's revenue model. While this indirect risk is not within the City's direct control, there are opportunities for the city to support the diversification of less carbon intensive revenue generation in the region.
- The implications of carbon pricing - The effects of carbon pricing may have important implications across Council, from increasing the cost of waste services to changing tenant profiles at key sites. The City of Adelaide should build on current emissions reduction initiatives to focus on reducing exposure to these risks. Understanding carbon hotspots across organisational operations and the integration of carbon consideration into procurement processes allows for more targeted and effective emissions reductions initiatives that will be best place to respond to any introduction of carbon pricing. This would address exposure to reputational as well as financial risks. Importantly, carbon mitigation and risk management plans should be part of an integrated, cross Council response and not occur in isolation.
- Driving built environment resilience - Council's role in ensuring and facilitating compliance with the building code is a key opportunity to drive increased resilience, both physical and transitional, across the built environment. Council should ensure that the planning team are resourced and have the capacity to respond to and enforce increasingly stringent planning requirements to reduce Council's exposure to reputational and transition risk.
- Opportunities for climate leadership - The consideration of transition risk provides additional impetus to take bold and prudent action to reduce the social and economic implications of a low carbon transition. The City of Adelaide has already established itself as a leader through Carbon Neutral Adelaide's goals for carbon neutral operations. This assessment underscores these efforts and suggests that there are more opportunities to cement its position with broad benefit in reduced risk exposure as well as sharing knowledge across industries and geographies.

5.4 Next steps

This climate risk assessment presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. Despite the strong track record of the City of

Adelaide in responding to climate change, like most councils, significant work is still required to address current and emerging risks.

Priority next steps include the following actions:

- Prioritise climate change governance actions – The climate change governance assessment has identified what is required to increase or maintain each of the quantitative and qualitative governance scores. This information should be used to identify priority short term actions, which should include a focus on addressing those indicators for which there is currently no information or that received a low score i.e. public risk disclosure, emergency management and climate change policy.
- Public disclosure of risks – One of the gaps identified in the climate change governance assessment was the absence of a publicly available register or document of Council's physical and transition risks. The information contained in this report could be used to generate a public facing version of this assessment to increase awareness amongst external stakeholders and the broader of Council's current and emerging risks.
- Incorporate physical and transition risks into Council's risk register – There was limited understanding amongst staff as to the extent to which climate risk is considered in Council's corporate risk register. The results of this assessment can now be used to update the corporate risk register. This can in turn be used to help prioritise adaptation options for implementation.
- Develop an adaptation roadmap – This risk assessment identifies potential adaptation measures for a large number of risks, including those rated as medium to high. To guide implementation of these measures, and to communicate how Council is building resilience to climate change, an adaptation action plan could be developed. This would identify the highest priority adaptation measures and indicate how their implementation will be sequenced through time. This should include how adaptation will be addressed through future procurement decisions.
- Liability measures – A range of liability risks were identified during the assessment, however, in the absence of independent legal opinion the extent of the legal liability risk can not be quantified. It is recommended that Council consider obtaining legal advice regarding medium to extreme liability risks, especially in regard to the potential impacts from flooding.

References

- Baker-Jones, M. (2014). Litigation risk from climate change rising [online]. *Government News*, 34(3). Retrieved from <https://search-informit-com-au.ezp01.library.qut.edu.au/documentSummary;dn=563564032310124;res=IELBUS> ISSN: 1447-0500
- Bell-James, J. (2017). Seek advice early to reduce legal risk. *CoastAdapt feature*. Retrieved from <https://coastadapt.com.au/seek-advice-early-reduce-legal-risk>
- Bell-James, J., Baker-Jones, M., & Barton, E. (2017). Legal risk. A guide to legal decision making in the face of climate change for coastal decision makers. In *CoastAdapt Information Manual 6, 2nd edn*. National Climate Change Adaptation Research Facility, Gold Coast.
- Beyond Zero Emissions. (2010). *Australian Sustainable Energy Zero Carbon Australia Stationary Energy Plan*. Melbourne: University of Melbourne.
- CBA. (2019). *Commonwealth Bank of Australia Annual Report*. CBA.
- Clos, J. (2015). *From COP21 to the New Urban Agenda*. (U. Chronicle, Producer) Retrieved May 22, 2019, from <https://unchronicle.un.org/article/cop21-new-urban-agenda>
- Colonial First State. (2020, June). *Responsible Investment*. Retrieved from Colonial First State: <https://www3.colonialfirststate.com.au/about-us/corporate-profile/responsible-investment/climate-change.html>
- IEA. (2020, June). *World Energy Model - Scenario Analysis of Future Energy Needs*. Retrieved from International Energy Agency: <https://www.iea.org/reports/world-energy-model/sustainable-development-scenario>
- Meinshausen, M., Smith, S., & Calvin, K. (2011). The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. *Climatic Change*. Retrieved from <https://doi.org/10.1007/s10584-011-0156-z>
- Resilient East. (2016). *Resilient East Regional Climate Change Adaptation Plan 2016*. for the Eastern Region in association with the Government of South Australia and the Australian Government. Retrieved February 24, 2020, from https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/sector_agreements/sector-agreement-resilient-east-gen.pdf
- Stafford Smith, M., Horrocks, L., Harvey, A., & Hamilton, C. (2011). Rethinking adaptation for a 4 °C World. *Philosophical transactions. Philosophical Transactions of the Royal Society*, 396, 196 - 216. doi:doi:10.1098/rsta.2010.0277
- TCFD. (2016). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Retrieved March 22, 2018, from <http://www.fsb.org/wp-content/uploads/Recommendations-of-the-Task-Force-on-Climate-related-Financial-Disclosures.pdf>
- The City of Adelaide. (2016). *Strategic Plan 2016-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-strategic-plan-landscape.pdf?mtime=20190509094049>
- The City of Adelaide. (2019). *Integrated Business Plan 2019-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/plan-integrated-business-plan-2019-20.pdf?mtime=20190702122042>

Appendix A – Governance Assessment Report

See attached report

Confidential Item 11.1 - Attachment A

Appendix B – Council staff interviewed

The following table presents a list of council staff interviewed for the physical risk assessment.

Name	Position/Name	Relevant category
Alan Beaton	Manager (People Experience)	People and HR
Angela Paleologos	Group Team Leader (Cleansing)	Cleaning services
Anna Jordan	Manager (People Service)	People and HR
Anne Rundle	Manager (Culture and Lifelong Learning)	Library services
Belinda Dohring	Senior Consultant, Sustainability	Water Features
Ben Clark	Lead Consultant (Strategic Asset Management)	Footpaths
David Carroll	Manager (Service Delivery & Operations)	Information Management & IT
Dominic Fitzsimons	Team Leader - Golf Business Operations (Golf Links)	Golf links
Emina Allegretti	Project Officer, Community Resilience (City Wellbeing)	Community grants
Garry Herdegen	Associate Director, Public Realm - Workshop Services	Workshop services
Jean-Pierre Koekemoer	Associate Director (Infrastructure)	Stormwater and Drainage Network
Johanna Williams	General Manager (Rundle Mall Management Authority)	Rundle Mall
Kristen mackintosh	Manager (Building Assessment and Compliance)	Planning and building
Kym Charnstrom	Facilities Maintenance Officer (Facilities Management)	Structural
Lauren Schliebs	Group Team Leader - Operations (Aquatic Centre)	Aquatic centre
Liz Packer	Manager (Financial Accounting)	Finance
Matt Jorgensen	Team Leader Horticulture (Citywide)	Horticulture
Paul Addle	Manager (Strategic Property)	Land
Rebecca Rutschack	Manager (Planning Assessment)	Planning
Rod Case	Manager (Procurement and Contract Management)	Finance and Procurement
Sharon Prior	Team Leader (Off-Street Parking Services)	Parking
Stacey Bateson	Manager, Business Engagement	Customer Service
Steve/Stephen Zaluski	Manager (Customer Experience)	Permits and licences
Tanya Roe	Senior Consultant, Sustainability	Sustainability
Trent Snowball	Operations Manager (ACMA)	Adelaide Central Market
Vicki Thompson	Operations Coordinator Off-Street Parking	Uparks
Vitor Martins	Manager (Waste & Cleansing & Fleet)	Depot and workshops

Appendix C – Transition risk and opportunity workshop attendees

Name of participants	Role
Bec Taylor	Sustainability Coordinator
Belinda Dohring	Senior Consultant, Sustainability
Lara Daddow	Manager, Carbon Neutral Adelaide
Maria Zotti	Manager, Sustainability
Paul Smith	Senior Consultant, Sustainability
Tanya Roe	Senior Consultant, Sustainability
William Van Ausdal	Technical Specialist (Climate Change and GHG Inventories)

CLIMATE CHANGE ADAPTATION GOVERNANCE ASSESSMENT

Climate Change Adaptation Governance Assessment Report for the City of Adelaide



INFORMED.CITY™

Visualisation



Prepared for:

The City of Adelaide

Date/ Version:

29 June 2020/ Version 4

Council documents downloaded on 24 February 2020

Prepared by:

Climate Planning and Edge Environment

Citation:

Climate Planning and Edge Environment 2020.
South Australia Climate Change Adaptation
Governance Assessment: Climate Change
Adaptation Governance Assessment Report for
the City of Adelaide, prepared for the City of
Adelaide, June 2020

Contact:

Donovan Burton
Climate Change Adaptation Specialist
Climate Planning
donovan@climateplanning.com.au

Dr Mark Siebentritt
Director
Edge Environment
mark.siebentritt@edgeenvironment.com

Caveat:

The information provided in the visualisations is the result of an analysis using Climate Planning's Informed.City™ tool, current as of 16th May 2020. This analysis has limitations based on the scope and resources allocated for this project, and therefore users should discuss these limitations with the authors before relying on the information. The method used to develop the visualisations and its results is copyright and cannot be used by any party without prior written permission from Climate Planning. The results cannot be relied upon by any third party and is not designed to (and therefore cannot be used to) support any legal, financial or insurance-based decisions without written approval from Climate Planning.

© Climate Planning 2020



Executive Summary

The City of Adelaide engaged Climate Planning and Edge Environment (Edge) to undertake an assessment of its climate change adaptation governance. This is one task under a broader climate risk assessment being delivered by Edge. This assessment indicates as to how well Council is incorporating climate change adaptation governance into their corporate processes and frameworks. The findings of this study include information collected from an online staff survey, results of the assessment of corporate documents, and findings from face-to-face meetings with representatives of the City of Adelaide. The report also provides a range of recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

Methodology

The Project Team used Climate Planning's Informed.City™ platform to implement the project. The governance assessment for the City of Adelaide was undertaken in two stages:

- **Quantitative Assessment** - typology-based review of local government inclusion and influence of climate change in publicly available corporate documents. Also included a survey of staff members' understanding of climate change impacts, their department's capacity to adapt and their perceived barriers and enablers to improved consideration of climate change in Council decision-making. The quantitative assessment was completed on the 24th of February 2020.
- **Qualitative Assessment** - qualitative analysis of local government consideration of climate change adaptation governance based on face-to-face meetings with key council staff members. These meetings were used to glean information about barriers and enablers to mainstreaming consideration of climate change. The qualitative assessment was conducted on the (19th and 20th February 2020).

Results and Specific Recommendations

The findings of this report bring together information obtained from the above two stages, with a summary of the key insights from the governance assessment presented below.

Quantitative assessment

The Project Team conducted a governance assessment of the City of Adelaide to explore how climate change was considered in their corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 1 displaying Council's performance.

Climate Change Adaptation Governance Assessment Report for the City of Adelaide

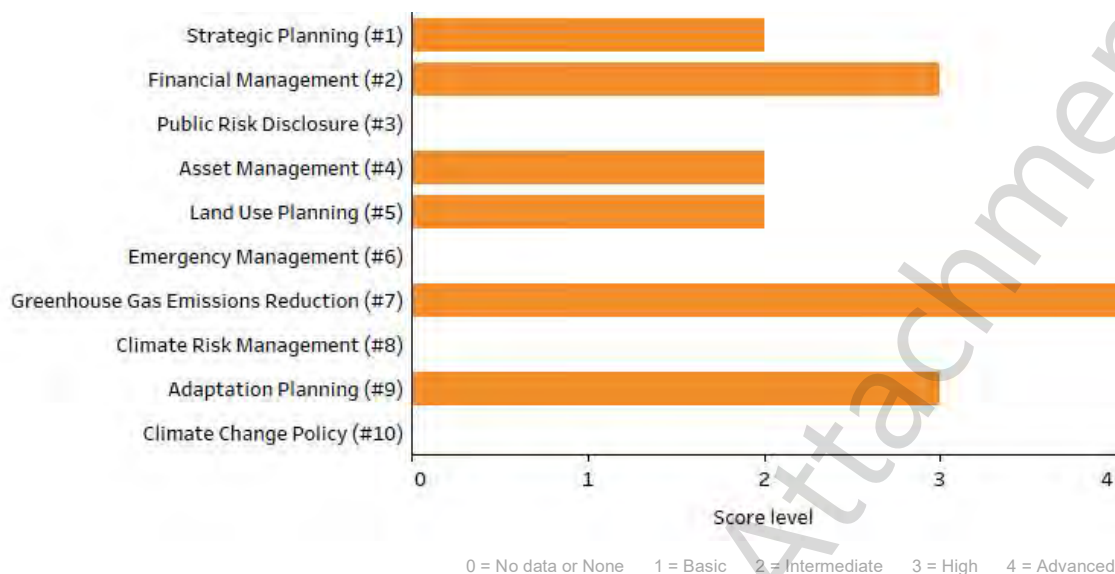


Figure 1: The City of Adelaide's quantitative scores for climate change adaptation governance

Table 1 provides the recommended 'first steps' which council should consider implementing for each indicator to improve their climate change adaptation governance scores.

Table 1: Recommended 'first steps' which the City of Adelaide should implement to improve their governance scores

Indicator Type Tag	Level	Recommendation
Strategic Planning (#1)	Intermediate	To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc.". Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaning information from other councils through peer-to-peer learning.
Financial Management (#2)	High	To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented. However, the effect of financial management issues on other council functions (e.g. assets) are important to consider. For example, understanding whether staff capacity, capability and training needs are a barrier to understanding climate change and its financial implications in your council.

Climate Change Adaptation Governance Assessment Report for the City of Adelaide

Indicator Type Tag	Level	Recommendation
Public Risk Disclosure (#3)	No data	No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Asset Management (#4)	Intermediate	To achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. An example of the text that would help improve consideration is: "Council recognises that climate change is likely to affect asset life and functionality. As such in future reports and analysis Council will explore how climate change will affect assets". The asset management plan should also specify a prescribed response to one of the climate change issues.
Land Use Planning (#5)	Intermediate	To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the Informed.City™ governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan.
Emergency Management (#6)	None	To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known disaster risks and affect those already especially vulnerable to natural hazards".
Greenhouse Gas Emissions Reduction (#7)	Advanced	Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.
Climate Risk Management (#8)	No data	No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Indicator Type Tag	Level	Recommendation
Adaptation Planning (#9)	High	This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders. There will be an initial outlay of resources required to achieve this level of adaptation planning (e.g. undertake climate change risk assessments, quantify the number of Council assets exposed to risk, cost and prioritise adaptation actions, and assign roles and responsibilities).
Climate Change Policy (#10)	None	A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an Informed.CityTM climate change adaptation governance assessment and have an advanced climate change policy.

Qualitative assessment

During the face-to-face meetings, the Project Team asked representatives of the City of Adelaide a series of questions about climate change. These questions were used in a qualitative analysis to understand the issues, barriers and enablers for considering climate change in decision making for the City of Adelaide. The results for the qualitative assessment are categorised into the seven indicators. From these results, the Project Team have devised the following specific recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

Indicator 11: Climate Risk Assessments

- 11.1 Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.
- 11.2 Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.

Indicator 12: Climate Legal Risk

- 12.1 Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.
- 12.2 Ensure that legal risks associated with climate change are included in the risk register, until well managed.

Indicator 13: Staff Capacity and Resource Allocation

- 13.1 Review opportunities to embed capacity building into existing staff training, such as new employee inductions.
- 13.2 Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.

Indicator 14: Community/ Stakeholder Engagement

- 14.1 Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.

Indicator 15: Institutional/ Intergovernmental Relationships

- 15.1 Seek to clarify the role of Council as compared with the State Government about managing climate risk.
- 15.2 Work with banks to better understand how they are considering the effects of climate change. It would be in the City's interest to identify how they identify risk and what they see determines resilience at a City level. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.

Indicator 16: Climate Change Information

- 16.1 Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.

Indicator 17: Information Systems

- 17.1 Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.
- 17.2 Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.
- 17.3 Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.

Conclusion

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction

indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

Table of Contents

Executive Summary	i
List of Figures	viii
List of Tables	ix
List of Abbreviations	x
1 Introduction	1
1.1 Responding to Climate Change	1
1.2 A South Australian Context	1
1.3 Assessing Climate Change Adaptation Governance	2
2 About This Report.....	3
3 Methodology.....	3
3.1 Quantitative Assessment	3
3.1.1 Keyword Analysis	5
3.1.2 Evaluation Matrices.....	5
3.2 Qualitative Assessment.....	6
4 Results and Specific Recommendations	7
4.1 Results for Staff Governance Survey	7
4.2 Results and Recommendations for Quantitative Assessment	9
4.2.1 Overview of Quantitative Assessment Results.....	9
4.2.2 Indicator 1: Strategic Planning.....	10
4.2.3 Indicator 2: Financial Management.....	12
4.2.4 Indicator 3: Public Risk Disclosure.....	15
4.2.5 Indicator 4: Asset Management	17
4.2.6 Indicator 5: Land Use Planning	19
4.2.7 Indicator 6: Emergency Management.....	21
4.2.8 Indicator 7: Greenhouse Gas Emissions Reduction	23
4.2.9 Indicator 8: Climate Risk Management.....	24
4.2.10 Indicator 9: Adaptation Planning.....	26
4.2.11 Indicator 10: Climate Change Policy	29
4.3 Results and Recommendations for Qualitative Assessment.....	31
4.3.1 Indicator 11: Climate Risk Assessments	31

4.3.2	<i>Indicator 12: Climate Legal Risk</i>	33
4.3.3	<i>Indicator 13: Staff Capacity and Resource Allocation</i>	34
4.3.4	<i>Indicator 14: Community/ Stakeholder Engagement</i>	35
4.3.5	<i>Indicator 15: Institutional/ Intergovernmental Relationships</i>	36
4.3.6	<i>Indicator 16: Climate Change Information</i>	37
4.3.7	<i>Indicator 17: Information Systems</i>	39
5	Conclusions	40
6	References	42
7	Appendices	44
	<i>Appendix A: Questionnaire from staff governance survey</i>	44
	<i>Appendix B: List of keywords used for quantitative assessment</i>	50
	<i>Appendix C: Questions used in the qualitative governance assessment</i>	50
	<i>Appendix D: Key terminology used in the quantitative assessment</i>	53

List of Figures

Figure 1: The City of Adelaide's quantitative scores for climate change adaptation governance	ii
Figure 2: Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016)	2
Figure 3: Number of the City of Adelaide staff members from each department who participated in the staff governance survey	8
Figure 4: The City of Adelaide's quantitative scores for climate change adaptation governance	9
Figure 5: Impact of climate change on the City of Adelaide's operations and procedures	11
Figure 6: Enablers contributing to the City of Adelaide's ability to plan for climate change	13
Figure 7: The City of Adelaide's level of preparedness for responding to climate change impacts ...	21
Figure 8: Barriers hindering the City of Adelaide's ability to plan for climate change	25
Figure 9: Use of climate change risk assessments in the City of Adelaide departments	32
Figure 10: Information sources commonly used by the City of Adelaide staff members to understand climate change impacts	38

List of Tables

Table 1: Recommended 'first steps' which the City of Adelaide should implement to improve their governance scores	ii
Table 2: Justification of climate change adaptation governance indicators for the quantitative assessment	4
Table 3: The City of Adelaide's corporate documents identified for the quantitative assessment	5
Table 4: Justification of climate change adaptation governance indicators for qualitative assessment	6
Table 5: Understanding of climate change impacts and adaptation for the City of Adelaide staff members.....	8
Table 6: The City of Adelaide's quantitative evaluation for climate change adaptation governance	10
Table 7: The City of Adelaide's indicator score for Strategic Planning	11
Table 8: The City of Adelaide's indicator score for Financial Management	14
Table 9: The City of Adelaide's indicator score for Public Risk Disclosure	16
Table 10: The City of Adelaide's indicator score for Asset Management	18
Table 11: The City of Adelaide's indicator score for Land Use Planning	20
Table 12: The City of Adelaide's indicator score for Emergency Management	22
Table 13: The City of Adelaide's indicator score for Greenhouse Gas Emissions Reduction	24
Table 14: The City of Adelaide's indicator score for Climate Risk Management.....	26
Table 15: The City of Adelaide's indicator score for Adaptation Planning	28
Table 16: The City of Adelaide's indicator score for Climate Change Policy.....	30
Table 17: Types of information which would help the City of Adelaide staff members incorporate climate change into job.....	38

List of Abbreviations

ASIC	Australian Securities and Investments Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWMS	Community Wastewater Management System
FTE	full-time equivalent
ICT	information communication technology
IPCC	Intergovernmental Panel on Climate Change
KPI	Key performance indicator
NCCARF	National Climate Change Adaptation Research Facility
QLD	Queensland
SEMP	State Emergency Management Plan
SMP	strategic management plans
TAS	Tasmania
TCFD	Task Force on Climate-related Financial Disclosures
UNFCCC	United Nations Framework Convention on Climate Change
WSUD	water-sensitive urban design
ZEMC	Zone Emergency Management Committees
ZEMP	Zone Emergency Management Plan

1 Introduction

1.1 Responding to Climate Change

Climate change is a pressing issue for local government that is already manifesting as a legal, social, economic and environmental risk. Local governments make decisions that span generations (e.g. roll-out of infrastructure, planning for future settlements) and as such need to be actively assessing and responding to the direct and indirect risks that climate change presents. However, since climate change presents a plethora of direct and indirect challenges that are likely to change over time, it will be impossible to effectively manage the issue in an ad-hoc and reactive manner.

Climate change requires a focus on both mitigation and adaptation activities. Mitigation limits the long-term contribution of greenhouse gas emissions to global environmental change and adaptation responds to the impacts that will already be locked into the climate system. The integration of mitigation and adaptation activities act as drivers for a low carbon economy, accessing economic and social opportunities.

Robust decision-making frameworks minimise future uncertainty as issues and information emerge and become important. This has been identified as the priority for Australian local governments:

Local governments will better respond to the challenges of climate change in an environment where adaptive responsibilities are clear, response and evaluation frameworks are consistent across jurisdictions, approaches to mainstreaming climate change adaptation are implemented, and decisions are made on the basis of the best data and information. (National Climate Change Adaptation Research Facility (NCCARF), 2013)

1.2 A South Australian Context

South Australia was the first jurisdiction in Australia to introduce climate change-specific legislation – the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act). The Act promotes climate change mitigation and adaptation action within South Australia that provides consistency with national and international schemes. In response to the Act, the Local Government Climate Change Adaptation Program was developed with the support of the Local Government Association Mutual Liability Scheme. This led to the first comprehensive assessment of climate risks across councils in South Australia, which were mostly undertaken over the period 2010 to 2011.

This initial experience with climate risk planning was built on following the release in 2012 of South Australia's adaptation framework "Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia". The framework outlined a consistent approach for the development of regional adaptation plans and delivery of integrated vulnerability assessments for all parts of the State. The resulting integrated vulnerability assessments and regional plans were completed over the period 2014 to 2017 and have been progressively implemented in most regions with the support of region-wide or council specific adaptation action plans.

1.3 Assessing Climate Change Adaptation Governance

The extent to which climate change risk and adaptation is considered in a local government's core governance documents may affect the implementation of the organisation's approach to climate change adaptation.

Measuring and monitoring indicators for climate change adaptation and mitigation governance provide a platform for a consistent approach. This allows local governments the ability to monitor and improve their performance over time. Initial focus and emphasis should be on a council's adaptation governance. Unless it can be ensured that a council's internal adaptive capacity is robust, that is its ability to respond to potential climate change impacts, then there is a risk that specific adaptation actions will be ad-hoc and constrained by limited resourcing and political support.

[Climate change] governance is not about the specific measure but the system and framework that supports the decision-making process...given the complexities and rapid emergence of regulations, evolving information and market responses, implementing [climate change] governance is the only way an organisation can truly maintain an effective response (Edwards, Burton, & Baker-Jones, 2017).

Understanding climate change governance may help decision-makers to estimate the vulnerability of a system to stress and address the underlying causes of vulnerability over time. It may help to support proactive decision-making by assisting organisations to identify both the risks and possible responses in advance and develop the capacity to implement the required actions.

The need to focus on climate change governance is gaining momentum in academic literature, United Nations publications and approaches, and corporate disclosure frameworks (Clos, 2015). For example, disclosure of governance arrangements around climate-related risks and opportunities is a key component of the recommendations of the Financial Stability Board's [Task Force on Climate-related Financial Disclosures](#) (TCFD) (see Figure 2).



Figure 2: Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016)

2 About This Report

This report presents the methodology and results of an analysis of the extent of climate change adaptation governance for the City of Adelaide. It includes the information collected from an online staff survey, results of the governance assessment, and findings from face-to-face meetings with representatives of the City of Adelaide. The report also provides a range of recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

This assessment predominantly focuses on adaptation governance. Mitigation has been considered only regarding formal greenhouse gas emissions reduction targets. A detailed greenhouse gas emissions governance assessment requires an audit of baseline emissions data and data recording protocols (e.g. emissions scope, alignment to Australian standards etc.) – which is outside the scope of this project.

3 Methodology











This project uses Climate Planning's climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance for the City of Adelaide. The governance assessment was undertaken in two stages:

- **Quantitative Assessment** - typology-based review of local government inclusion and influence of climate change in publicly available corporate documents. Also includes a survey of staff members' understanding of climate change impacts, their department's capacity to adapt and their perceived barriers and enablers to improved consideration of climate change in Council decision-making.
- **Qualitative Assessment** - qualitative analysis of local government consideration of climate change adaptation governance based on face-to-face meetings with key council staff members. These meetings were used to glean information about barriers and enablers to mainstreaming consideration of climate change.

3.1 Quantitative Assessment

The quantitative assessment aimed to identify publicly available corporate documents for the City of Adelaide and undertake a deeper exploration into how climate change is considered in those governance documents. These corporate documents are the key governance documents that either drive the organisational decision-making or report on the effectiveness of those processes. The documents were assessed against ten quantitative indicators for climate change adaptation governance (see Table 2).

Table 2: Justification of climate change adaptation governance indicators for the quantitative assessment

Indicator	Justification
 Strategic Planning	Strategic Planning documents direct how decision-makers in local government must discharge their responsibility under State legislation. Including considerations of climate change here will likely result in better likelihood for mainstreaming the issue in the council's operations and financial structures.
 Financial Management	If ignored, the effects of climate change are likely to have a considerable impact on a council's financial performance. This includes costs associated with asset management, service delivery, legal risk and insurance. Climate change may also affect rateable property value and therefore have the potential to affect council's primary income stream.
 Public Risk Disclosure	There is an increasing demand in the private sector for a transparent approach to addressing climate-related risk. A transparent approach means public disclosure of risks. Over time councils can expect insurers and finance providers, amongst others, to request councils to disclose how they are addressing climate-related risk.
 Asset Management	Local governments have hundreds of millions (and in some cases billions) of dollars invested in assets. Some of the assets that councils maintain have a long life expectancy and as such may be exposed to direct and indirect climate change risks. This generates a potentially unexplored or under-quantified financial risk for local governments.
 Land Use Planning	Land use planning can play a critical role in climate change adaptation. Strategic and local planning decisions can both increase or decrease the exposure of human settlements to climate change impacts. If done well effective land use planning can support climate-resilient and low energy development.
 Emergency Management	There are significant opportunities to drive climate change adaptation decision making through emergency management planning. Adaptation has numerous supporting benefits for emergency management including the implementation of risk planning for disaster mitigation and preparedness, response capacity and minimising exposure to reoccurring situations.
 Greenhouse Gas Emissions Reduction	Climate change mitigation actions allow for an exploration and promotion of resilient energy systems and passive solar design that may reduce human health-related issues as well as considerable energy savings. Furthermore, it is very likely that climate change adaptation will need to occur in a carbon-constrained economy.
 Climate Risk Management	Climate change is a complex issue that will exacerbate existing risks and present new ones. Often climate change risk management is undertaken in an ad hoc way – resulting in inconsistent approaches within an organisation. Some direction that defines how climate change risk is identified and disclosed will greatly improve council's adaptation planning.
 Adaptation Planning	Best practice adaptation plans identify the actions required to mitigate specific risks and have mechanisms in place to respond to physical, transitional and liability risks. Adaptation planning helps to set key performance indicators and establish roles and responsibilities across council and more broadly.
 Climate Change Policy	An internal Climate Change Policy (or corporate standard/ statement of intent) allows the organisation to place a climate change lens over all of council's activities and use the existing system to drive adaptation, risk minimisation and transition to a lower-carbon economy. It can allow for the agreed use of information sources and specific triggers for change.

The quantitative assessment focusses specifically on an assessment of Council's corporate document which are publicly available which means they are accessible through an online platform (e.g. Council's website). An analysis of only public documents supports the growing recognition that disclosure of climate risk is an important element in climate change management. This is reinforced by Edwards et al. (2017) who state that "it is not enough to do the right thing, one must also be seen to be doing the right thing." The Paris Agreement recognises transparency as a fundamental principle in climate change management (both in actions and in governance). There is also an increasing call for local government disclosure of risk and governance responses by those who re-

insure local government risk. Proactive disclosure aids market decisions and also increases public trust in the government (Kim & Kim, 2007).

3.1.1 Keyword Analysis

The Project Team has identified 13 publicly available corporate documents from the City of Adelaide which align with the ten quantitative indicators of climate change adaptation governance (see Table 3). The team conducted a keyword analysis to identify how many words associated with climate change were present in Council's documents. Some of the words reviewed include 'climate change', 'adaptation' and 'greenhouse gas emissions' (a complete list of words can be found in Appendix A). If any of these words were identified, the Project Team undertook a closer analysis of the context to assess the extent of how they were considered in the documents.

Table 3: The City of Adelaide's corporate documents identified for the quantitative assessment

Indicator	Document Name
Strategic Planning (#1)	<ul style="list-style-type: none"> Strategic Plan 2016-2020
Financial Management (#2)	<ul style="list-style-type: none"> Integrated Business Plan 2019-2020
Public Risk Disclosure (#3)	
Asset Management (#4)	<ul style="list-style-type: none"> Building Asset Management Plan 2016 Infrastructure Asset Management Policy 2020 Park Lands Open Space Asset Management Plan 2016 Transportation Asset Management Plan 2017 Urban Elements Asset Management Plan 2016 Water Infrastructure Asset Management Plan 2016
Land Use Planning (#5)	<ul style="list-style-type: none"> Development Plan 2020 Adelaide Design Manual 2016
Emergency Management (#6)	<ul style="list-style-type: none"> Eastern Adelaide Zone Emergency Management Plan 2018
Greenhouse Gas Emissions Reduction (#7)	<ul style="list-style-type: none"> Carbon Neutral Strategy 2015-2025
Climate Risk Management (#8)	
Adaptation Planning (#9)	<ul style="list-style-type: none"> Resilient East Regional Climate Change Adaptation Plan 2016
Climate Change Policy (#10)	

3.1.2 Evaluation Matrices

The Project Team assessed the corporate documents for each governance indicator using a scoring system developed by Climate Planning. The method is relatively simple as it uses scaled matrices with descriptions on a continuum between no consideration and an advanced consideration of climate change. The Project Team scored the corporate documents using a five-point scale which was tailored to each governance indicator in the quantitative assessment (these evaluation matrices are provided in Section 4.2).

Since the quantitative assessment relies on an analysis of the corporate documents, Council staff were not directly engaged for the quantitative indicators. Although, some findings obtained from the face-to-face meetings may inform and/ or provide context about some of the quantitative indicators and will, therefore, be presented in the results where relevant. However, they are not








given any weight in the conclusions of this report (other than limitations/ barriers to mainstreaming noted by the staff).

The findings in this report are based on a quantitative assessment of the City of Adelaide that was completed on the 24th of February 2020.

3.2 Qualitative Assessment

The purpose of the qualitative assessment was to build a more complete representation of climate change adaptation by focussing on the complex drivers which could not be understood through an assessment of public corporate documents in the quantitative assessment. These drivers are captured in seven qualitative governance indicators (see Table 4).

Table 4: Justification of climate change adaptation governance indicators for qualitative assessment

Indicator	Justification
 Climate Risk Assessments	Climate change risk assessments are useful for identifying and quantifying the potential effects of climate change. They provide organisations with the critical information they need to understand the impacts that climate change may present. Risk assessments also help to identify and prioritise issues that require further investigation and/ or adaptation actions.
 Climate Legal Risk	Climate change is emerging more and more as a climate legal risk problem that governments, organisations and the community are attempting to understand, avoid and manage. The nature of climate legal risk for local governments is a minefield that can manifest itself in many ways. There is the potential that one lawsuit could erode a council's financial resilience.
 Staff Capacity and Resource Allocation	Monitoring councils' resource and staffing commitment to climate change is critical to supporting ongoing climate change adaptation. If a council only relies on external consultants for adaptation research and responses, then it is doing very little to support the improved internal adaptive capacity of its organisation. The overarching goal for adaptation should be to mainstream consideration of climate change across all council activities.
 Community/ Stakeholder Engagement	Connecting to the community is a core component for developing a safer, more resilient community. It is a local community who will bear the brunt of climate change impacts as they directly or indirectly contribute towards adaptation efforts (e.g. through increased insurance costs, taxes, and voluntary community actions).
 Institutional/ Intergovernmental Relationships	Climate change is a trans-boundary issue. Adaptation action (or inaction) by one stakeholder can both improve and erode the resilience of another. Economies of scale and collectively sharing knowledge can improve adaptation governance. The actions by a range of organisations have the potential to affect councils' resilience.
 Climate Change Information	Understanding the impacts of climate change requires access to climate change information. Whilst institutions such as NCCARF, CSIRO, and universities freely provide valuable publications on climate change risk and adaptation, obtaining climate change projections (e.g. from climate change models) is often a time consuming and expensive task, or one that can misalign with councils' timing needs.
 Information Systems	As the information technology age continues to shape our society it comes as no surprise to see that information services are playing an increasing role in supporting council operations and providing a new interface with the community it serves. Information communication technology networks such as social media platforms, websites and information portals have the potential to contribute significantly to councils' climate change adaptation ambitions.

The Project Team undertook face-to-face meetings with representatives from the City of Adelaide. During the meeting conversations, representatives were asked a series of questions which the Project Team later used in a qualitative analysis to understand the issues and barriers and enablers for considering climate change in decision making for the City of Adelaide. The information was obtained through a set of consistent questions aligned to the relevant themes. The series of core questions are provided at the end of this report (see Appendix B).

The results collected through the qualitative assessment are not directly attributed to a 'score'. The findings from this assessment are used to build a better understanding of some areas of these indicators that may not become evident through a reading of the documents in isolation. While findings will not be attributed to a score, the outcome will inform any discussion or recommendations. They will also be recorded for comparative review of future assessments.

The face-to-face meetings for Council were conducted on the 19th and 20th February 2020.

4 Results and Specific Recommendations

The results focus on interesting findings of the governance assessment as well as possible links drawn from a survey of staff members. This section first provides an overview of the results for the staff governance survey. It then addresses the results and specific recommendations for the quantitative and qualitative assessment separately. Any interesting findings from the face-to-face meetings or the staff governance survey which relate to a specific governance indicator have also been integrated into the results.

4.1 Results for Staff Governance Survey

Of the 254 staff members in the City of Adelaide who participated in the staff governance survey, the highest representation work in the Customer Service department (38 staff members, 15%). This is closely followed by the Water and Waste department which had 27 staff members (11%) participate in the online survey (see Figure 3).

It is important to note that 254 respondents are considered a high response rate for an individual council's survey response. Such a large sample size provides Council with more information about their staff members understanding about climate change impacts and provides more reliable results. The City of Adelaide should be commended for their participation efforts for this survey.

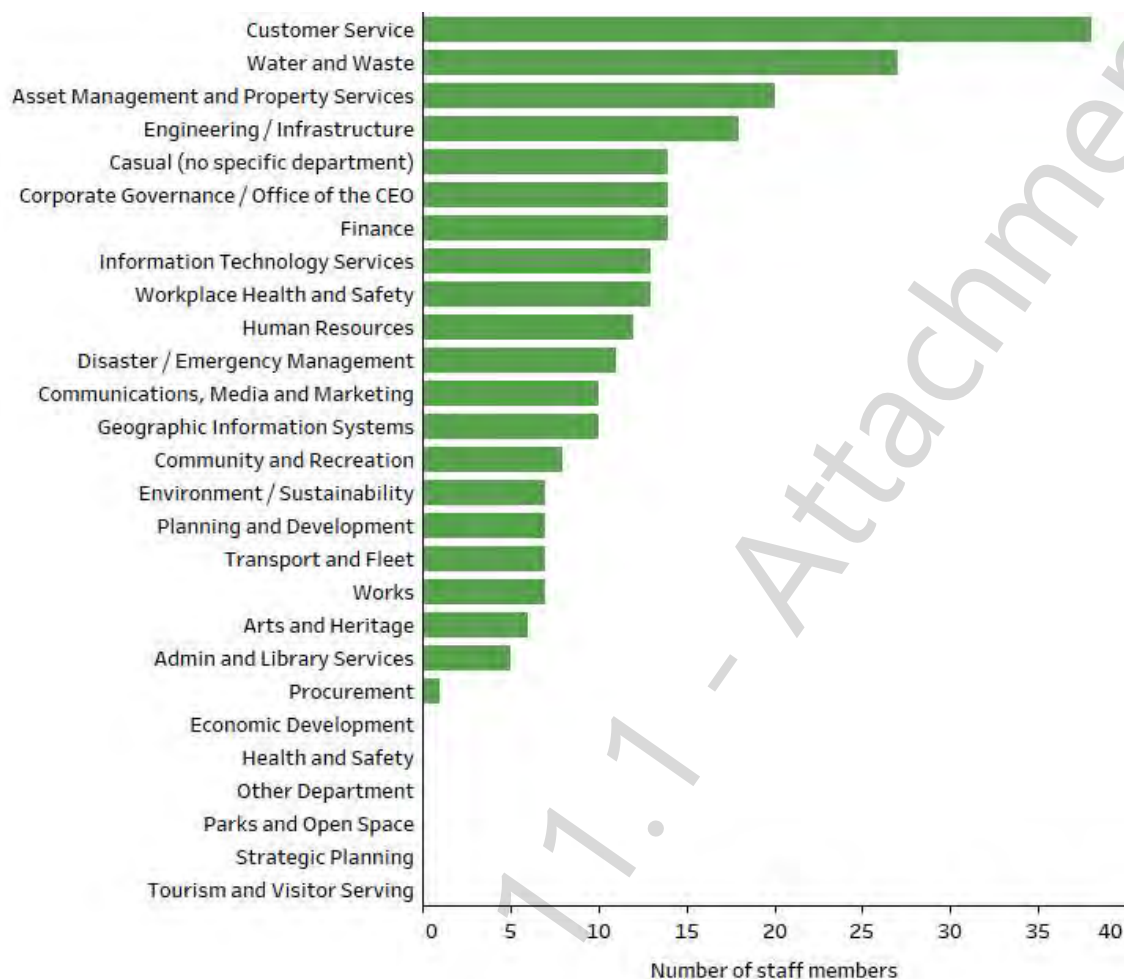


Figure 3: Number of the City of Adelaide staff members from each department who participated in the staff governance survey

The online survey found that 86% of respondents have some level of understanding of climate change impacts and adaptation. There were 123 staff members who stated that their understanding is limited, and 93 staff members who believed that they could comfortably incorporate/ consider climate change in their job (see Table 5). Furthermore, 144 respondents (64%) identified a good understanding of climate change as an enabler to Council's ability to plan for climate change.

Table 5: Understanding of climate change impacts and adaptation for the City of Adelaide staff members

	Number of staff members	% of staff members
I am not sure of my understanding	26	10%
I have no understanding	8	3%
My understanding is limited	123	49%
I could comfortably incorporate/ consider climate change adaptation	93	37%
Total	250	100%

4.2 Results and Recommendations for Quantitative Assessment

The specific results of the quantitative assessment have been divided into the ten quantitative indicators of climate change adaptation governance. This section will elaborate on the City of Adelaide's results for each governance indicator and provide specific recommendations for how council can transition to a higher score level. The analysis of each indicator will discuss the importance of the indicator, staff survey results, quantitative assessment results, and specific recommendations. Findings from the face-to face meetings will be provided for relevant indicators.

Please note that only one recommendation has been provided for each indicator as a 'first step' for council to transition to the next score level. These recommendations are specific to each level which means that completing one recommendation will only improve Council's score by one level. For this reason, there may be a range of recommendations which Council can implement to achieve a desired indicator score. For example, there are three specific recommendations which a council can implement to transition from 'Intermediate' to 'Advanced' for a particular indicator.

4.2.1 Overview of Quantitative Assessment Results

The Project Team conducted a governance assessment of the City of Adelaide to explore how climate change was considered in their corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 4 displaying Council's performance.

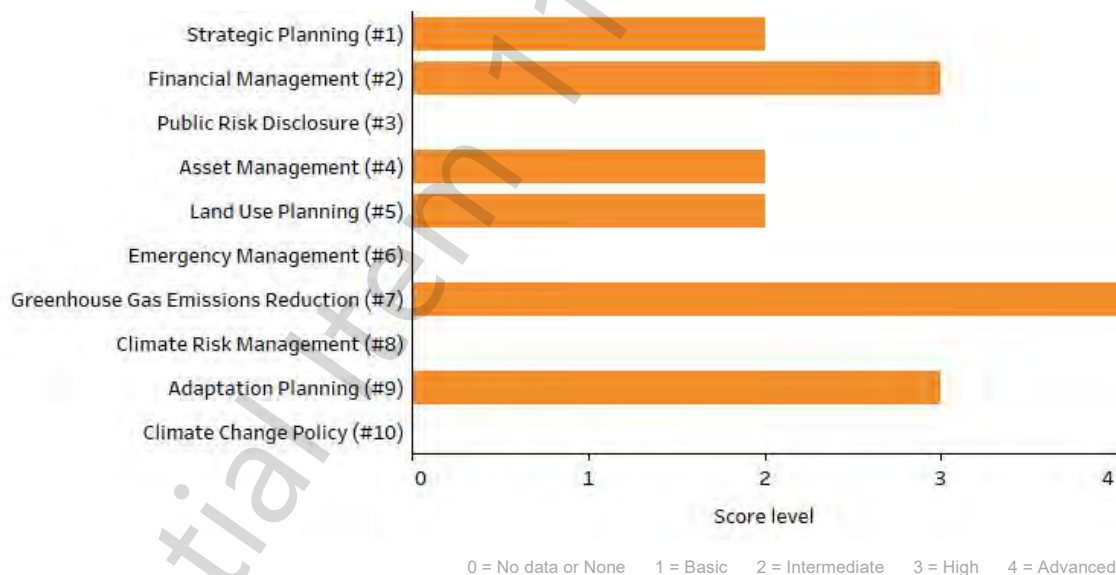


Figure 4: The City of Adelaide's quantitative scores for climate change adaptation governance

The evaluation matrix (see Table 6) provides a summary of the City of Adelaide's for each governance indicator including descriptions to explain how the indicators were assessed.

Table 6: The City of Adelaide's quantitative evaluation for climate change adaptation governance

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme. Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.

4.2.2 Indicator 1: Strategic Planning

Justification for this indicator

The strategic management plans (SMPs) are local government's core guiding documents that combine the community's aspirational vision, together with Council's commitments to actions to achieve these goals. Under Section 122 (1) of the *Local Government Act 1999*, "A council must develop and adopt plans (which may take various forms) for the management of its area, to be called collectively the strategic management plans" (Government of South Australia, 2019). These plans aim to identify the council's objectives for the area over a period of at least 4 years.

SMPs establish the vision, goals and objectives for a local government, as well as help shaped formal management processes. There is no prescribed format for Council SMPs and as such the information contained in them varies from council to council. Given the influence of the SMP, any consideration of climate change in the document/s is likely to assist local government adaptation decision-making.

Staff survey results

The online survey showed that 166 staff members (68%) believe that climate change is impacting Council's operations and procedures now and around 15% of respondents (36 staff members) believe it will be felt within the next 15 years (see Figure 5).

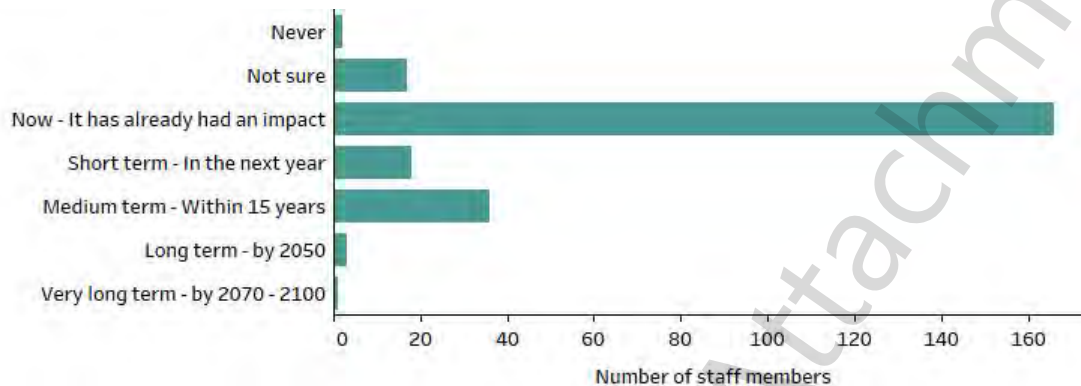


Figure 5: Impact of climate change on the City of Adelaide's operations and procedures

Quantitative assessment results

The Project Team reviewed the Strategic Plan 2016-2020 for this indicator. The plan provides objectives to assist Council in becoming a carbon neutral city with a specific focus in on reducing greenhouse gas emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Strategic Planning indicator (see Table 7).

Table 7: The City of Adelaide's indicator score for Strategic Planning

Level (Score)	Indicator Description
No data	No publicly available Strategic Management Plan/s were found.
None (0)	No consideration of climate change (or associated keywords) in the Strategic Management Plan/s.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of prescribed responses, climate change issues, council functions, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Strategic Planning indicator:

To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc.". Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaned information from other councils through peer-to-peer learning.

Findings from the face-to-face meetings

There was high awareness that the City of Adelaide's Strategic Plan considers climate change. However, participants suggested that an even clearer strategic direction is warranted that applies to specific functions such as assets and services across Council. It was noted that if it were improved it would help further mainstream the consideration of climate change into the organisation.

4.2.3 Indicator 2: Financial Management

Justification for this indicator

Climate change is increasingly seen as a financial management issue. The cost of direct and indirect impacts will cascade through the economy and affect costs associated with a local government's activities and responsibilities. For example, at a local level, changes in the productivity of the wine sector could impact wine and tourism businesses, while homes at risk from flood and fire could lead to reduced property values in some areas. At an international level, increased extreme weather in Asia may disrupt global supply chains and affect the availability of certain goods and services for local governments, or increased litigation may affect local government insurance costs (general insurance and liability cover). The *Local Government Act 1999* requires local governments to prepare a Long-Term Financial Management Plan (s.122)(1a) and an Annual Business Plan (s. 123)(1) as part their system of financial management.

Furthermore, climate change adaptation requires initial and ongoing outlay of resources and commitment of staff time. Resource constraints and/or lack of financial commitment from local governments are often identified as a primary barrier to implementing climate change adaptation. In Climate Planning's experience, it involves minimal resourcing for a council to achieve a 'Basic' or 'Intermediate' score for Financial Management, however, to reach the upper score ranges ('High' and 'Advanced') requires a more formal and strategic commitment.

Staff survey results

In the online survey, 114 staff members (49%) identified limited assigned funding as a barrier hindering Council's ability to plan for climate change, which ranked first in the collection of barriers. On the other hand, 62% of respondents (139 staff members) acknowledged that an understanding the costs/ benefits of climate change adaptation actions is an enabler for climate change. This was a popular enabler among staff members, with it ranked second in the list of enablers (see Figure 6). Other enablers identified were external funding (64 staff members, 28%) and avoiding future unbudgeted costs (61 staff members, 27%).

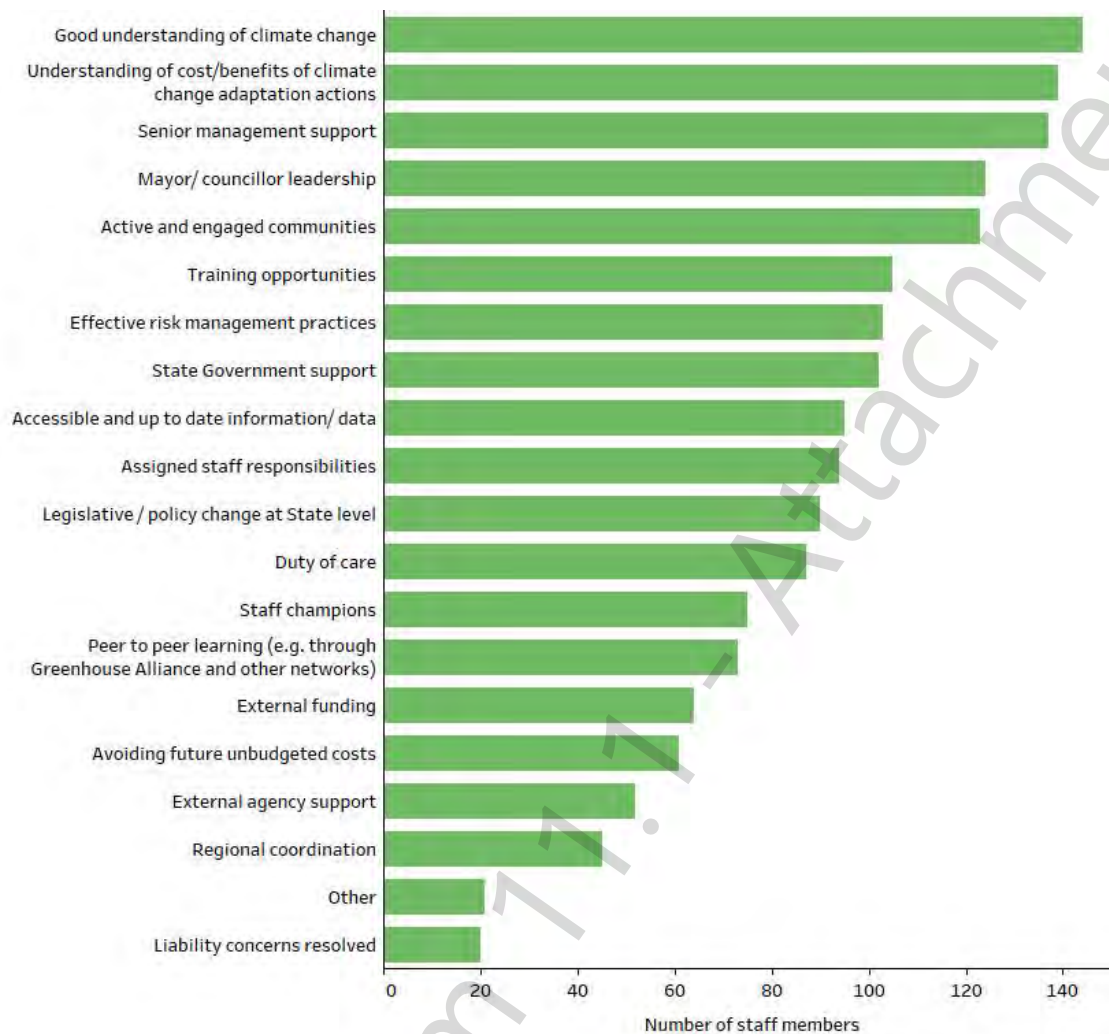


Figure 6: Enablers contributing to the City of Adelaide's ability to plan for climate change

Quantitative assessment results

The Project Team assessed the Integrated Business Plan 2019-2020 for this indicator. The plan considers climate change, specifically for the Climate Change Action Initiatives Fund. Through this fund Council seeks to:

... invest in strategic incentive programs such as \$1.6 million for the climate change initiatives including the sustainability incentives scheme, sustainability performance improvement programs, low and zero emission vehicles, Carbon Neutral Adelaide Partners Program and Building Upgrade Finance. (The City of Adelaide, 2019)

Since the initiative aims to deliver a range of projects, programs and incentives, this sees the City of Adelaide score 'High' for the Financial Management indicator (see Table 8).

Table 8: The City of Adelaide's indicator score for Financial Management

Level (Score)	Indicator Description
No data	No publicly available financial management documents ¹ were found.
None (0)	No consideration of climate change (or associated words) in the financial management documents ¹ .
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Advanced (4)	Climate change adaptation is well-budgeted for and resources allocated for mainstreaming. Consideration for climate change in investments and/or investment policies etc. is stated. Innovated finance mechanisms may also be encouraged.

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues and council functions

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'High' to 'Advanced' in the Financial Management indicator:

To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented. However, the effect of financial management issues on other council functions (e.g. assets) are important to consider. For example, understanding whether staff capacity, capability and training needs are a barrier to understanding climate change and its financial implications in your council.

Findings from the face-to-face meetings

In the meetings, some financial-related issues were highlighted demonstrating widespread awareness of the potential financial implications of climate change. These included:

- Heatwave risk presents many financial challenges to Council and general local economy. For example, Council has evidence which shows hotter days can result in up to a 19% reduction in retail activity in the CBD and there are reports of a 30% decline in foot traffic in the CBD during the heatwave in the lead up to Christmas 2019. The financial ramifications for Council may include increased pressure to undertake unplanned capital expenditure to cool Rundle Mall. Without this expenditure, there may also be financial exposure due to businesses moving to a different location (affecting rateable income and/or rental income streams).

- It was noted by the staff interviewed that there is a direct link between extremely hot days and workplace productivity – especially related to outdoor staff. As temperatures increase there is a reduced opportunity for staff to work outdoors due to health and safety concerns. It was noted by one workshop participant that the financial ramification of a heatwave could be as much as \$10,000 per hour in lost productivity.
- Several staff members recognised that when access to the Torrens River water supply is constrained it results in an increase in water costs for Council (approximately \$1,500 per day).
- Bushfire and flood events result in increased clean-up costs. If climate change is likely to affect flooding and bushfire risk then there is likely to be an increased budget allocation for post-event clean-up costs (as it is not likely that Council would opt to reduce the service and not clean up after an event).
- Extreme events were noted to have a material effect on some of Council's business units. For example, an extremely hot day may see a decrease in car parking revenue and an increase in the casual visitation numbers at the aquatic centre (e.g. December 2019 numbers saw a 10% increase).
- It was noted during the meetings that if infrastructure and assets are less able to meet required service levels, or have a reduction in working life, then this could devalue the asset base for Council. This could in turn impact on Council's ability to raise capital.

Additional Recommendations Associated with Financial Management

- Consider developing an internal climate change fund to respond to climate-related risks (e.g. like the City of Onkaparinga Climate Resilient Fund)
- Plan and budget for passive cooling designs for Rundle Mall as an area that shoppers can go to during a heatwave.
- Establish a system (e.g. job code/s) that enables quantification of climate-related risks and risk management activities.
- Ensure climate change is embedded into the processes of the Strategic Risk and Internal Audit Group
- Review accountancy standards and Australian Securities and Investments Commission (ASIC) guidelines for climate-related financial risk management and reporting (e.g. AASB/IASB practice standards).

4.2.4 Indicator 3: Public Risk Disclosure

Justification for this indicator

There is considerable evidence to suggest that climate change will have a material impact on a local government's operations and as such, it would be prudent to assess the consideration of climate change in Council's public risk registers. Currently, there is no regulatory requirement to maintain a public risk register however the *Local Government Act 1999* requires councils to manage their risks. However, Section 48 (aa1) of the *Local Government Act 1999* requires each Council to have

prudential management “policies, practices and procedures” that must be applied to all Council projects, not just large ones (Government of South Australia, 2019).

There is increasing pressure for organisations to disclose their climate change related risks (e.g. Carbon Disclosure Project programs – which encourage organisations to publicly disclose climate risks). Over time councils can expect insurers and finance providers, amongst others, to request councils to disclose how they are addressing climate-related risk. Furthermore, the Paris Agreement (which Australia is a signatory to) maintains a strong focus on transparency and disclosure.

This level of transparency helps to inform businesses and the community about the emerging risks and control measures that a council is implementing (or intends to implement). Council should seek advice on which elements of climate change risk can be effectively disclosed.

Quantitative assessment results

The City of Adelaide’s website was searched for a strategic risk register, however, no publicly available risk register was found. The Project Team reviewed all corporate documents from the other governance indicators however were unable to find any risk disclosure information. As a result, the City of Adelaide scored ‘No data’ for the Public Risk Disclosure indicator (see Table 9).

Table 9: The City of Adelaide’s indicator score for Public Risk Disclosure

Level (Score)	Indicator Description
No data	No publicly available risk register OR risk disclosure documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the public available risk register OR risk disclosure documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one climate change risk ¹ (e.g. infrastructure risk) only.
High (3)	Detailed inclusion of climate change (more than one climate change issue AND/OR climate change risk), but is limited to responses to direct impacts ¹ of climate change.
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, climate change risks, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from ‘No data’ to ‘None’ in the Public Risk Disclosure indicator:

No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Findings from the face-to-face meetings

Council staff indicated that the management of the corporate risk register was compliant with legislation but that it was not available to the general public. It was also noted that climate change was not captured adequately in the risk register. In fact, some staff noted that the poor consideration of climate change in the corporate risk register was one of the drivers for this assessment.

4.2.5 Indicator 4: Asset Management

Justification for this indicator

Local governments have hundreds of millions (and in some cases billions) of dollars invested in assets. Some of the assets that councils maintain, or are likely to install and maintain, have a long life expectancy and as such may be exposed to direct and indirect climate change risks. A failure of asset management consideration generates a potentially unexplored or under-quantified financial risk for local governments. The *Local Government Act 1999* requires local governments to prepare an Infrastructure and Asset Management Plan (s.122)(1a).

In 2013, the Australian Standards released the voluntary standard AS5334-2013 Climate Change Adaptation Standard for Settlements and Infrastructure – a Risk-Based Approach. The fact that this standard has recently been developed signals that organisations are anticipating compliance requirements. Over time government agencies that provide infrastructure funding or co-funding to councils will likely require climate change to be considered in the delivery of projects. How a local government manages assets under climate change will be a key determinant in understanding a settlement's limits to adaptation.

Quantitative assessment results

The Project Team assessed the following six asset management documents for this indicator:

- Building Asset Management Plan 2016
- Infrastructure Asset Management Policy 2020
- Park Lands Open Space Asset Management Plan 2016
- Transportation Asset Management Plan 2017
- Urban Elements Asset Management Plan 2016
- Water Infrastructure Asset Management Plan 2016

All of Council's asset management plans consider climate change, with an emphasis on how these Asset Management Plans address Council's strategic planning actions to reduce carbon emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Asset Management indicator (see Table 10).

Table 10: The City of Adelaide's indicator score for Asset Management

Level (Score)	Indicator Description
No data	No publicly available asset management documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the asset management documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, council functions, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Asset Management indicator:

To achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. An example of the text that would help improve consideration is: "Council recognises that climate change is likely to affect asset life and functionality. As such in future reports and analysis Council will explore how climate change will affect assets". The asset management plan should also specify a prescribed response to one of the climate change issues.

Findings from the face-to-face meetings

During the face-to-face meetings, staff members recognised that the asset management plans were key documents in ensuring that Council was effectively understanding and managing its climate risks. However, some of the workshop participants suggested that currently, the consideration of climate change into asset management was ad-hoc. They also noted that some of the Asset Management Plans were currently being reviewed, which provided an opportunity to have better consideration of climate change.

Specific examples of the impacts of climate change on the operation and maintenance of assets were:

- the implications of increasing impervious cover which when combined with greater rainfall intensity will lead to greater flood risk;
- the potential for drainage infrastructure to become overwhelmed with projections of increasing rainfall intensity in the future, leading to greater flood risk such as in the south-eastern corner of the CBD;

- greater demand for water-sensitive urban design (WSUD) features which could help to manage flood risk and also improved urban greening outcomes, such as have already been demonstrated in streets in the south-western part of the CBD; and
- the impact of warmer and drier conditions on trees and green space, which is relevant to the Park Lands Open Space Asset Management Plan.

It was noted that while there was broad awareness of the potential impacts of climate change on assets, it was necessary to obtain more evidence on performance under different conditions.

4.2.6 Indicator 5: Land Use Planning

Justification for this indicator

Land use planning can play a critical role in climate change adaptation. Strategic and local planning decisions can increase or decrease the exposure of human settlements to climate change impacts. Climate change is a risk multiplier for local government. The primary risk extends well beyond just sea level rise (which is conventionally exclusively considered) and can include increased riverine and urban flood risk, increased heatwaves, increased bushfire risks and the potential for increased intensity of extreme storm events to name a few. These risks can be minimised by effective land use planning.

Under South Australian legislation, “a development plan is a statutory policy document which guides the type of development that can occur within a council area” (Government of South Australia, 2018). Part 4 (s.9) of the *Planning Development and Infrastructure Act 2016* states that:

Until 1 July 2020, a Development Plan under the repealed Act (as in force at a relevant time) will have effect for the purposes of this Act as if it formed part of the Planning and Design Code (subject to the operation of this clause). (Government of South Australia)

Whilst councils’ influence on a development plan may be constrained by overarching South Australian policies and/or legislation there is still a broad array of responses that local government can implement to manage the challenges associated with climate change.

Staff survey results

In the online survey, 135 staff members (61%) believe that statutory planning support is very helpful in adapting to climate change impacts.

Quantitative assessment results

The Project Team assessed two documents for this indicator, they were Council’s Development Plan 2020 and the Adelaide Design Manual 2016. The review did not find keywords related to climate change in Development Plan. However, the Adelaide Design Manual specifically identifies the importance of street trees and plants in “preparing for the future challenges of climate change and creating a more climate resilient city” (City of Adelaide, 2016). The manual was included in this assessment as it provides strategic and technical guidance for the design and management of public spaces in the City of Adelaide. This sees the City of Adelaide score ‘Intermediate’ for the Land Use Planning indicator (see Table 11).

Table 11: The City of Adelaide's indicator score for Land Use Planning

Level (Score)	Indicator Description
No data	No publicly available Development Plan was found.
None (0)	No consideration of climate change (or associated keywords) in the Development Plan.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Brief inclusion of climate change for one or more climate change issue ¹ AND/OR planning theme ¹ . Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
High (3)	Detailed inclusion of climate change for one or more climate change issue AND/OR planning theme (including detailed strategies or suggested responses). May need updating to reflect the most recent IPCC assessment report from the date of publication. May have also considered other planning instruments (e.g. guidelines).
Advanced (4)	A significant consideration is given to climate change. Importantly, the Development Plan also includes responses to indirect impacts ¹ of climate change. Must also reflect the latest science - most recent IPCC assessment report from the date of publication.

¹ See Appendix C for definitions of prescribed responses, climate change issues, planning theme, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Land Use Planning indicator:

To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the Informed.City™ governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan

Findings from the face-to-face meetings

Staff noted that land use planning was a stronger driver for minimising risk – however, there was a recognition that the Government of South Australian has most of the control over how land use plans are shaped. As such it was likely that the City's role for land use planning may be better suited as one of advocacy.

Key land use planning issues identified by staff were the continued growth in high-density developments in the CBD and changing demand for transport options. These were seen as presenting both opportunities and challenges for reducing emissions (e.g. transition to new modes of transport) and managing climate risk (e.g. buildings designed to be resilient to a different future climate).

4.2.7 Indicator 6: Emergency Management

Justification for this indicator

There are some important opportunities to drive climate change adaptation decision making through local government emergency management planning. Adapting to the effects of climate change has numerous supporting benefits for emergency management including the implementation of risk planning for disaster mitigation and preparedness, building appropriate response capacity and minimising exposure to reoccurring situations. Consideration of the long-term trends of climate change is fundamental for assessing risks, while still maintaining the ability to respond to unanticipated events and ensuring that emergency management is approached from a planning and mitigation perspective rather than purely as a responsive entity.

Under Section 9 (1e) of the *Emergency Management Act 2004*, the State Emergency Management Plan (SEMP) establishes eleven Zone Emergency Management Committees (ZEMCs) which are responsible for ensuring effective emergency risk management at the zone level. A key role of the ZEMCs is to develop a Zone Emergency Management Plan (ZEMP) to address residual risk and evaluate treatment options (Government of South Australia, 2016). As well as having a ZEMP some councils also have local emergency management plans or business interruption plans. To achieve the 'Advanced' score in this assessment, a council must have a local emergency management plan (or similar) that comprehensively considers climate change.

Staff survey results

The online survey revealed that 86 staff members (35%) believe that the City of Adelaide is 'prepared' for responding to climate change impacts which is slightly more than the 76 staff members (31%) who believe that Council is not prepared (see Figure 7). Interestingly, there are another 68 staff members (28%) who were unsure of Council's level of preparedness for climate change. It should also be noted that no staff members from the Disaster/ Emergency Management department participated in the online survey.

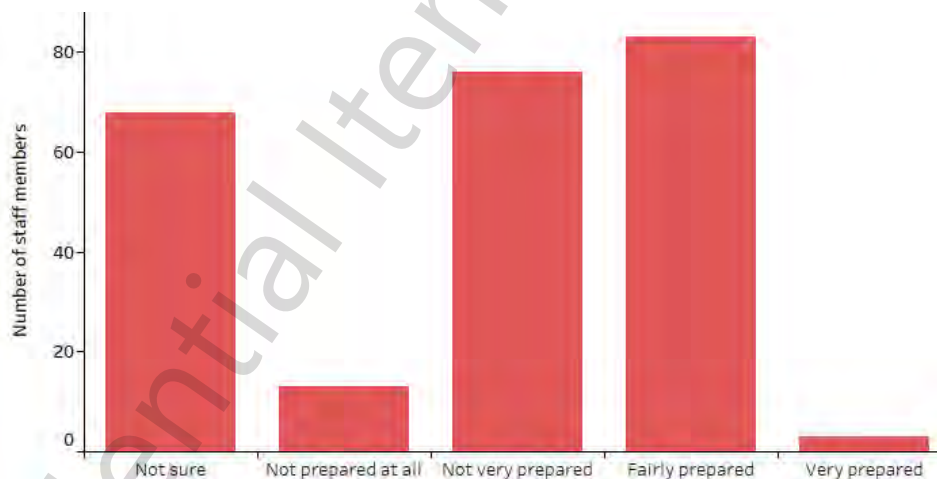


Figure 7: The City of Adelaide's level of preparedness for responding to climate change impacts

Quantitative assessment results

The Project Team assessed only the Eastern Adelaide Zone Emergency Management Plan 2018 for this indicator as a publicly available council emergency management plan was not found for the City of Adelaide. Since no consideration of climate change (or associated keywords) was found in the plan, the City of Adelaide scored 'None' for the Emergency Management indicator (see Table 12).

Table 12: The City of Adelaide's indicator score for Emergency Management

Level (Score)	Indicator Description
No data	No publicly available emergency management plan/s was found.
None (0)	No consideration of climate change (or associated keywords) in the emergency management plan/s*.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Considers climate change issues ¹ in at least one element of emergency management (e.g. plan for increased heatwaves) in either a council or regional emergency management plan.
High (3)	Considers climate change issues in two or more elements of emergency management (e.g. plan for increased heatwaves) in a council emergency management plan.
Advanced (4)	A council emergency management plan exists and considers climate change issues in all elements of emergency management (e.g. provides climate scenarios, links to international and national leading standards, includes other council climate studies etc).

¹ See Appendix C for definitions of climate change issues

* If a regional document is searched then a localised adjustment is applied for coastal hazards. This may mean that a coastal council may score differently to an inland council for the same regional plan.

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Basic' to 'Intermediate' in the Emergency Management indicator:

To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known disaster risks and affect those already especially vulnerable to natural hazards".

Findings from the face-to-face meetings

Although participants generally demonstrated a strong general knowledge of potential physical climate risks such as extreme heat and flooding, and fire in regional areas surrounding Metropolitan Adelaide, face-to-face meetings identified few emergency management processes or plans that were directly considering climate change. Nevertheless, it was noted that Council has established a volunteer group of leaders who are participating in a ten-week training to help deliver the messaging of emergency management under a changing climate.

Specific observations from meetings included that:

- there is awareness that bushfires in the regions surrounding Adelaide can have a direct impact on the City, including by impacting the number of workers coming into the CBD and the number of people visiting shops and restaurants;
- the requirement for emergency services for people experiencing heat stress, such as in exposed areas like Rundle Mall, may increase under projected changes in extreme heat; and
- there is a risk assessment process but there is limited understanding of how climate-related risks relevant to emergency services feed into the risk register.

4.2.8 Indicator 7: Greenhouse Gas Emissions Reduction

Justification for this indicator

Climate change mitigation actions are listed as a core governance process for adaptation, as they allow for an exploration and promotion of resilient energy systems and passive solar design that may reduce human health-related issues (e.g. heat stress), as well as considerable energy savings. Furthermore, it is likely that all climate change adaptation will need to occur in a carbon-constrained economy.

Understanding the nexus between the two is an important element of adaptation. Many infrastructure-based adaptation actions (e.g. sea walls) are carbon-intensive and as such local governments will need to consider this in any cost-benefit analysis.

Quantitative assessment results

The Project Team searched for a climate change target in Council's greenhouse gas emissions documents, other core governance documents identified in the quantitative assessment, and on Council's website. The assessment found a consideration to reduce greenhouse gas emissions in the Carbon Neutral Strategy 2015-2025 which establishes Council's aspiration to be a carbon neutral city. The strategy sets two emissions reduction targets:

1. "The City of Adelaide has reduced its carbon emissions by 35% by 2020 (from the 2006–07 baseline year).
2. The City of Adelaide has zero net carbon emissions by 2025." (The City of Adelaide, 2015)

These targets are reflected in Council's Strategic Plan and Asset Management Plans. These results see the City of Adelaide score 'Advanced' for the Greenhouse Gas Emissions Reduction indicator (see Table 13).

Table 13: The City of Adelaide's indicator score for Greenhouse Gas Emissions Reduction

Level (Score)	Indicator Description
None (0)	No publicly available greenhouse gas emissions documents were found. Also, climate change target or consideration to reduce greenhouse gas emissions was not found in any of the core governance documents OR displayed on Council's website.
Basic (1)	A commitment or consideration to reduce greenhouse gas emissions is generally mentioned (either in greenhouse gas emissions documents, other core governance documents OR displayed on Council's website). Climate change target established to 2020* only.
Intermediate (2)	Climate change target established to 2030 (or one other single date) but minimal information on existing greenhouse gas emissions. No target for carbon neutrality.
High (3)	Climate change target established out 2050 but no target for carbon neutrality. Information on Council's current/ historical greenhouse gas emissions is provided.
Advanced (4)	Climate change target and aim for carbon neutrality by or before 2050.

* If in a future assessment the year 2020 has past, then the emissions reduction target MUST be established to 2025

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to maintain an 'Advanced' in the Greenhouse Gas Emissions Reduction indicator:

Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.

Findings from the face-to-face meetings

There was extensive knowledge of Carbon Neutral Adelaide across the different functions of Council. Staff noted that Council had a progressive emissions reduction target and were likely to be better at mainstreaming mitigation than adaptation.

4.2.9 Indicator 8: Climate Risk Management

Justification for this indicator

The Climate Risk Management indicator assesses the extent to which climate change is embedded into Council's traditional risk management policies or strategies. While complementary, it is different from the information captured in Indicator 3: Public Risk Disclosure by taking a more high-level approach to risk management.

Climate change is a complex issue that will exacerbate existing risks and present new ones. Some direction that mandates how climate change risk is identified and disclosed will greatly improve Council's adaptation planning. If a local government does not know what is at risk and the consequences of those risks, then they are unlikely to implement adaptation actions.

Staff survey results

In the online survey, 107 staff members (46%) believe that misunderstood risks are barriers to Council's ability to plan for climate change, which ranked second in the collection of barriers. Nevertheless, 46% of respondents (103 staff members) recognised that effective risk management practices would better enable the City of Adelaide to plan for climate change.

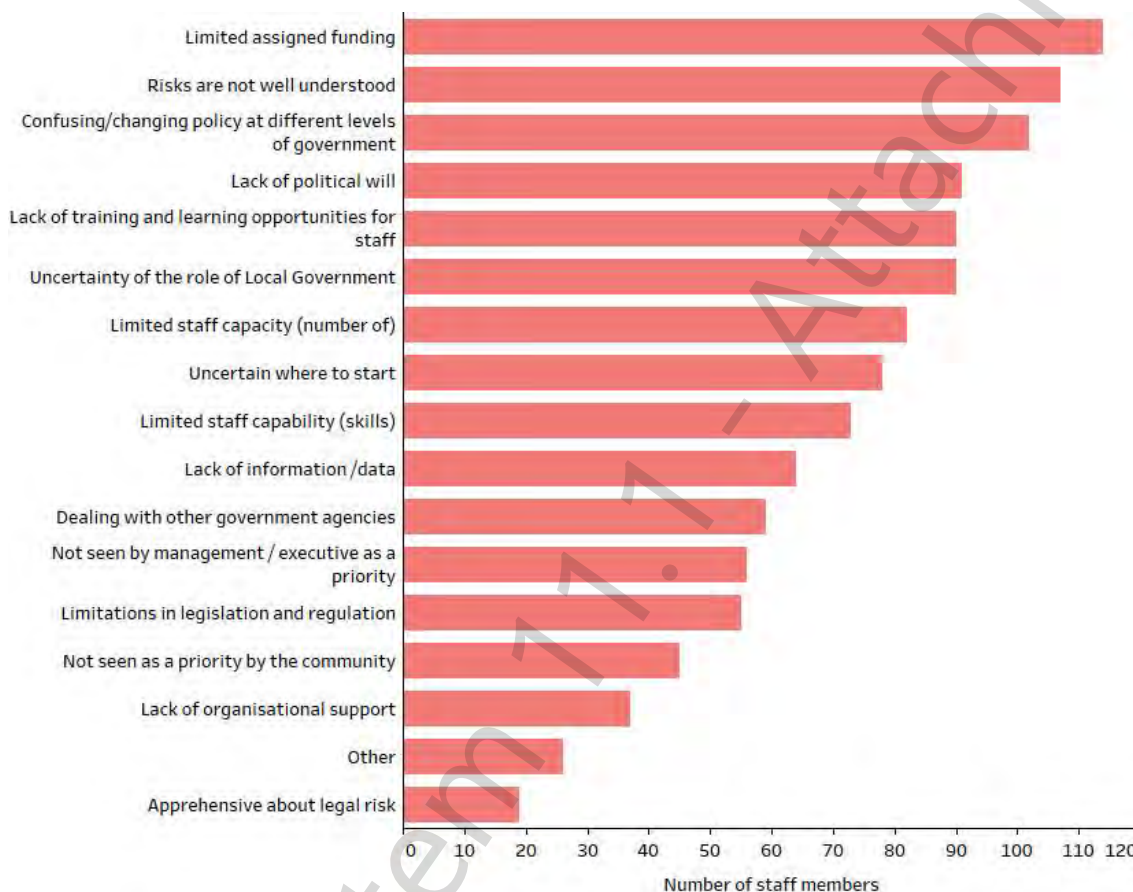


Figure 8: Barriers hindering the City of Adelaide's ability to plan for climate change

Quantitative assessment results

The City of Adelaide's website was searched for a risk management policy, strategy and/or plan. Since no publicly available risk management documents were found, the City of Adelaide scored 'No data' for the Climate Risk Management indicator (see Table 14).

Table 14: The City of Adelaide's indicator score for Climate Risk Management

Level (Score)	Indicator Description
No data	No publicly available risk management documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the risk management documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one climate change risk ¹ (e.g. infrastructure risk) only.
High (3)	Detailed inclusion of climate change (more than one climate change issue AND/OR climate change risk), but is limited to responses to direct impacts ¹ of climate change.
Advanced (4)	Climate change issues AND/OR climate change risks should be considered in all risk decision-making. Must include responses to indirect impacts ¹ of climate change.

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, climate change risks, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'No data' to 'None' in the Climate Risk Management indicator:

No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Findings from the face-to-face meetings

Climate risks to assets, services and Council operations were discussed in almost all meetings. While general awareness was high about the potential for risks to arise, it was recognised that there is no standard Council-wide approach to climate risk management or for integrating climate risks across Council into the corporate risk register.

The staff interviewed were commonly of the view that Council needed to improve the consideration of climate change in its risk management system, although some teams reported that they had identified climate change as an issue to address in their area of responsibility. It was noted by some that a climate change policy may help guide strengthening of how climate risk management occurs within Council.

4.2.10 Indicator 9: Adaptation Planning

Justification for this indicator

A Climate Change Adaptation Plan helps council implement a staged process for adapting to climate change. Good practice adaptation plans also identify the actions required for specific risks

and has mechanisms in place to respond to direct and indirect climate change risks. In particular, good practice adaptation planning helps to:

- clarify roles and responsibilities,
- identify prioritised activities and focus areas,
- allocate resourcing,
- identify triggers for action or change/review,
- establish monitoring and evaluation mechanisms, and
- effectively manage any maladaptation risks.

South Australia's Strategic Plan (recently repealed) specified "the development of regional climate change adaptation plans in all State Government regions by 2016" (Government of South Australia, 2012). This was supported by South Australia's adaptation framework, 'Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia' which:

recognises that climate change and its economic, social and environmental impacts will vary across South Australia and therefore provides for the development of locally relevant adaptation responses across the 12 existing State Government regions. (Government of South Australia, 2012)

Staff survey results

In the online survey, 47 staff members acknowledged having training for climate change adaptation (21% of respondents surveyed). There was some diversity in where staff members received their adaptation training, with it being from other training (19), and a university or TAFE subject (15), a consultant (12), peak body training package (12), and a university degree in climate change adaptation (9).

Quantitative assessment results

The Project Team assessed only the Resilient East Regional Climate Change Adaptation Plan 2016 for this indicator as a publicly available council adaptation plan was not found for the City of Adelaide. This plan is Council's regional climate change adaptation plan which aims to provide a coordinated and collaborative response to climate change across the Eastern Region. The plan achieves these goals by identifying priority adaptation actions which will respond to the challenges and opportunities presented by a changing climate (Resilient East, 2016). This sees the City of Adelaide achieve a 'High' for the Adaptation Planning indicator (see Table 15).

Table 15: The City of Adelaide's indicator score for Adaptation Planning

Level (Score)	Indicator Description
None (0)	No publicly available climate change adaptation strategy and/or action plan* (or similar council-wide strategy/ action plan that drives adaptation planning) were found.
Basic (1)	Focussed on one specific climate change issue ¹ AND/OR one council function ¹ with only summary statements for adaptation provided (not the whole of Council).
Intermediate (2)	Summary statements for more than one climate change issue AND/OR council function provided but only for Council activities (not community). Time frames for adaptation actions also allocated.
High (3)	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Advanced (4)	A council adaptation strategy and/or action plan exists. It must include ALL of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders.

¹ See Appendix C for definitions of climate change issues and council functions

* If a regional document is searched then a localised adjustment is applied for coastal hazards. This may mean that a coastal council may score differently to an inland council for the same regional plan.

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'High' to 'Advanced' in the Adaptation Planning indicator:

This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders. There will be an initial outlay of resources required to achieve this level of adaptation planning (e.g. undertake climate change risk assessments, quantify the number of Council assets exposed to risk, cost and prioritise adaptation actions, and assign roles and responsibilities).

Findings from the face-to-face meetings

There was a low to moderate level of awareness of the existence of the Resilient East Climate Change Adaptation Plan and the general content contained in that Plan with respect to physical risks for the Council and potential impacts. It was not clear from meetings how the actions from the Regional Plan were being translated into Council specific activities, with notable exceptions such as urban heat mapping and the use of WSUD to better manage flood risk and support urban greening.

Despite this some of the staff at the face-to-face interviews noted that there are a number of activities associated with and explicitly designed for climate change adaptation. Staff noted that there is a focus on being a "climate-ready" community in the Strategic Plan.

4.2.11 Indicator 10: Climate Change Policy

Justification for this indicator

An internal climate change policy (or corporate standard) allows the organisation to place a climate change lens over all of a council's activities and use the existing system to drive adaptation. It can allow for the consistent application of standards, agreed use of information sources and specific triggers for change. Staff members in local government have a range of viewpoints regarding the existence of climate change. Adopting a formal policy places limitations on the extent that personal viewpoints affect the professional judgments of people who may be sceptical or deny the existence of climate change.

A formal policy can also drive concerted action for staff members who are complacent regarding the effects of climate change. There is evidence to suggest that the creation of a policy has helped other local governments to affect change. This has been an effective trigger for change in other local government' such as Kingborough Council (TAS), Mackay Regional Council (QLD) and Whitsunday Regional Council (QLD).

Staff survey results

The survey shows that 164 staff members (73%) believe that internal policies which direct action on climate change (e.g. a climate change policy) are very helpful in adapting to climate change impacts.

Quantitative assessment results

The Project Team searched the City of Adelaide's website for a climate change policy (which includes adaptation) and/or an environment/ sustainability policy, however, no relevant policies were found. This sees the City of Adelaide score 'None' for the Climate Change Policy indicator (see Table 16).

Table 16: The City of Adelaide's indicator score for Climate Change Policy

Level (Score)	Indicator Description
None (0)	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.
Basic (1)	Climate change is considered in either a climate change policy OR environment/ sustainability policy. There are prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
Intermediate (2)	Climate change is considered in either a climate change policy OR environment/ sustainability policy. Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
High (3)	A specific climate change policy exists and considers numerous climate change issues. Must also reflect the latest science - most recent IPCC assessment report from the date of publication. Does not have all the attributes listed in the 'Advanced' score level.
Advanced (4)	A comprehensive climate change policy exists. It must include ALL of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), community and/or stakeholder engagement.

¹ See Appendix C for definitions of prescribed responses, climate change issues and council functions

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'None' to 'Basic' in the Climate Change Policy indicator:

A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an Informed.City™ climate change adaptation governance assessment and have an advanced climate change policy.

Findings from the face-to-face meetings

Staff noted that Council did not have a specific Council scale climate change policy. However, many staff interviewed stated that they thought a specific climate change policy would help drive consistent decision-making through the organisation.

4.3 Results and Recommendations for Qualitative Assessment

The results for the qualitative assessment focus on the seven indicators that are identified as key drivers for implementing climate change adaptation governance. The analysis of each indicator will discuss the importance of the indicator, staff survey results, qualitative assessment results, and specific recommendations.

4.3.1 Indicator 11: Climate Risk Assessments

Justification for this indicator

Climate change risk assessments provide organisations with the critical information they need to understand the impacts that climate change may present. Risk assessments take many forms, although in Australia most of them tend to follow the ISO Risk Assessment Framework AS31000.

Understanding specific risks is a complex task, and undertaking detailed risk assessments can be expensive, time-consuming and involve numerous experts and stakeholders. Because of these limitations, many local governments have opted for scoping or high-level risk assessments. Scoping risk assessments involve a smaller number of climate change scenarios and local governments are usually focussed on Council's corporate risks (as opposed to also understanding environmental, social and economic risks).

Although scoping assessments are always useful for quickly identifying general risks and areas that require further investigation, their ability to accurately reflect the level of risk is limited by the investment in time and resources that go into them.

Staff survey results

In the online survey, respondents were asked if their department uses climate change risk assessments to inform decision making (see Figure 9). The results indicate more staff members who do not use climate change risk assessments, with 41% responding 'No' (101 staff members). Also, 20 staff members (8%) stated that their department uses climate change risk assessments regularly, and another 41 staff members (17%) identified using risk assessments only sometimes. Interestingly, there are 160 staff members (72%) who believe that guidance on risk assessment and reducing risk exposure for councils would be very helpful in adapting to climate change impacts.

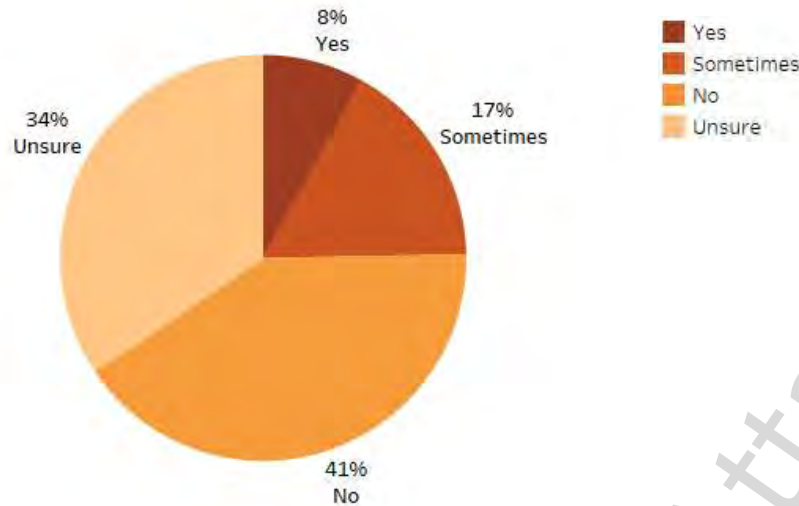


Figure 9: Use of climate change risk assessments in the City of Adelaide departments

Qualitative assessment results

A climate change risk assessment is currently being developed as part of this broader climate change project. Staff noted that some specific risk assessments have been undertaken but there is no overarching project that explores all of Council's climate change risks.

Staff discussed numerous climate-related risks during the meetings including the potential:

- impact of extreme heat on residents and retail trade, especially in parts of the city with limited shade;
- greater requirements for support for heat stress for visitors to the city of for the homeless;
- impact of extreme heat on major outdoor events;
- influence of hotter and drier conditions on greening across the City - specifically tree health;
- increased requirements for irrigation due to longer periods of hot and dry conditions, which will in turn influence operating costs;
- increased costs for operating facilities and buildings due to a greater need for cooling;
- further changes to work hours to reduce the need for staff to be outdoors during hot weather;
- devaluation of assets due to reduced performance and operating life; and
- increase in liability claims from hazards such as flooding.

Specific recommendations of the qualitative assessment

- 11.1 Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.
- 11.2 Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.

4.3.2 Indicator 12: Climate Legal Risk

Justification for this indicator

Climate change is emerging more and more as a climate legal risk problem that governments, organisations and the community are attempting to understand, avoid and manage. The nature of climate legal risk for local governments is a minefield that can manifest itself in many ways.

There has been a marked increase in legislation associated with managing climate change, - especially in coastal regions (e.g. sea-level rise and land use planning). How a Council interprets new regulations can become a point of conflict, especially if there is the potential for legislation to affect the value of property or the rights to development.

The climate legal risk facing local governments is not just limited to land use planning decisions. The ramifications of ignoring climate legal risk can include:

- Risk of increased planning challenges and negligence. (Baker-Jones, Burton, Bell, & Chang Seng, 2013)
- Risk of criminal negligence if a person is harmed due to a council's action (or inaction).
- Risk of unplanned financial expenditure defending legal challenges. There is anecdotal evidence of councils in Australia spending millions of dollars on single lawsuits.
- Risks associated with releasing or withholding information about projected climate change risks. (Productivity Commission, 2012)

All the above have the potential to have a considerable negative impact on a council's financial sustainability. There is the very real potential that just one lawsuit could erode a council's financial resilience.

Staff survey results

In the online survey, 19 staff members (8%) stated that they see apprehension about legal risk as a barrier to implementation of climate change adaptation actions (e.g. legal risk associated with undertaking climate change adaptation). On the other hand, staff members acknowledged that a better understanding of the legal risks would help to incorporate climate change in their work, with respondents identifying 'duty of care responsibilities' (87 staff members, 39%) and 'resolved liability concerns' (20 staff members, 9%) as enablers to climate change adaptation.

Qualitative assessment results

The assessment found that Council has not sought independent legal advice for any specific climate-related risks and that the respective role of Council compared to residents and businesses in responding to climate risks is unclear.

There was a strong interest in better understanding what Council's statutory requirements are in relation to risk management. Some of the staff noted that they had attended a climate legal risk presentation and that it was an issue that was still in the embryonic stages of understanding within the organisation.

The City of Adelaide has not been required to attend court or a tribunal for any climate change planning issues (e.g. related to development applications). Furthermore, Council's insurer (the Local Government Association Mutual Liability Scheme) has not requested any specific information about how Council is managing its climate change risk.

Participants did not identify any instances where Council had refused developments based on climate change risks.

Specific recommendations of the qualitative assessment

- 12.1 Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.
- 12.2 Ensure that legal risks associated with climate change are included in the risk register, until well managed.

4.3.3 Indicator 13: Staff Capacity and Resource Allocation

Justification for this indicator

Monitoring Council's resource and staffing commitment to climate change is critical to supporting ongoing climate change adaptation. If a council only relies on external consultants for adaptation research and responses, then it is doing very little to support the improved internal adaptive capacity of its organisation. Furthermore, without a permanent adequate annual budget, a council will only be able to undertake adaptation actions in an ad hoc manner. The overarching goal for adaptation should be to mainstream consideration of climate change across all council activities.

Staff survey results

In the online survey, 90 staff members (39%) identified a lack of training and learning opportunities for staff as a barrier to the implementation of climate change adaptation actions. Other barriers identified include limited staff capacity - number of staff (82 staff members, 35%), and staff capability - skills (73 staff members, 31%). On the other hand, training opportunities were recognised as an enabler of climate change adaptation action by 105 staff members (47%). Respondents also identified other enablers including assigned staff responsibilities (94 staff members, 42%), staff champions (75 staff members, 33%), and peer-to-peer learning (73 staff members, 32%). Also, 50% of respondents (107 staff members) believe that capacity building is very helpful in adapting to climate change impacts.

Qualitative assessment results

There was a broad understanding of the importance of climate change as an issue presenting risks and opportunities for Council. This awareness was driven to a large degree by the Council's commitment to the Carbon Neutral Adelaide initiative and, to a lesser extent, the Resilient East Regional Climate Change Adaptation Plan.

Many participants indicated an understanding of climate change adaptation activities directly relevant to their functional areas, covering both services and assets.

While many staff stated they had a general understanding of climate change there was a consensus that additional tailored training would be beneficial. The staff noted that Council was supportive of professional development activities. Some staff expected that they were likely to be exposed to training from peak bodies as the issue emerged further.

Specific recommendations of the qualitative assessment

- 13.1 Review opportunities to embed capacity building into existing staff training, such as new employee inductions.
- 13.2 Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.

4.3.4 Indicator 14: Community/ Stakeholder Engagement

Justification for this indicator

Connecting to the community is a core component for developing a safer, more resilient community. It is the local community who will bear the brunt of climate change impacts as they directly or indirectly contribute towards adaptation efforts (e.g. through increased insurance costs, taxes, and voluntary community actions). Given the fact that climate change is a contentious issue and one that is open to misinterpretation and misinformation, there is a strong imperative for Council to ensure that the community is appropriately informed of the issue.

As well as being informed, it is also essential that the community become active participants in the climate change adaptation process. According to Gardner et al. (2009), there are several considerable benefits associated with actively including the wider community in the decision-making process. These include:

- Facilitating clear communication and exchange of information, with all parties involved developing a more thorough understanding of issues, potential solutions and alternative perspectives.
- Improving the effectiveness of decision-making processes, by gaining better insight into potential equitable outcomes, solutions to conflicts and effective planning.
- Strengthening the resources of involved groups, by increasing awareness, confidence, skills and co-operation.
- Improving the sustainability of any initiatives, by increasing the quality of decisions and their acceptance amongst stakeholders. (Gardner, Dowd, Mason, & Ashworth, 2009)

Councils need to commence a dialogue with the private sector and better understand how businesses and local governments can learn from each other's understanding of the risks and approaches to adaptation.

Staff survey results

In the online survey, 45 staff members (19%) agreed that climate change not being seen as a priority for the community is a barrier to the implementation of climate change adaptation actions. The results also highlighted the importance of the local community – with 55% of respondents (123 staff members) stating that having an active and engaged community is a core enabler for improving Council's ability to plan for climate change.

Qualitative assessment results

Community awareness about climate change has become an important driver for action within Council. This is reflected in Council's commitment to Carbon Neutral Adelaide and the declaration of a Climate Emergency.

The City has a strong community engagement focus, working proactively with residents, businesses and other organisations such as universities. Examples of past Council engagement that support climate change action include heat preparedness messaging before and during heatwave events, participation in the 'Hot Hot Hot' event, and community engagement about the value of city greening through the use of tree tags.

It was noted that there is a focus on being a 'climate-ready' community in the Strategic Plan and messaging with the community is centred on empowerment rather than a 'fear-based' approach.

Participants did not identify any instances where Council has worked with Indigenous traditional owners of the land regarding climate change issues.

Specific recommendations of the qualitative assessment

- 14.1 Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.

4.3.5 Indicator 15: Institutional/ Intergovernmental Relationships

Justification for this indicator

Climate change is a trans-boundary issue. Adaptation action (or inaction) by one stakeholder can both improve and erode the resilience of another. Furthermore, economies of scale and collectively sharing knowledge can improve adaptation governance. The actions by a range of organisations have the potential to affect councils' resilience. An important part of the institutional arrangements and engagement with external stakeholders is the clarification of roles and responsibilities that are associated with climate change adaptation.

Staff survey results

In the online survey, 59 staff members (25%) recognised that dealing with other government agencies is a barrier hindering Council's ability to plan for climate change. Conversely, respondents also identified regional coordination (52 staff members, 30%) and external agency support (45 staff members, 26%) as enablers to the implementation of climate change adaptation actions.

Interestingly, 137 staff members (79%) from the City of Adelaide identified senior management support as a core enabler contributing to Council's ability to plan for climate change.

Qualitative assessment results

There was a view among some participants that the relative roles and responsibilities of local government as compared with the State Government about responding to climate change was

unclear at present. It was suggested that this issue requires clarification as part of the next phase of climate change planning within Council.

Specific recommendations of the qualitative assessment

- 15.1 Seek to clarify the role of Council as compared with the State Government about managing climate risk.
- 15.2 Work with banks to better understand broader market risk and how they are considering the effects of climate change. It would be in the City's interest to identify how banks identify risk and what they see determines resilience at a City level. This may help City of Adelaide understand risk to rateable income due to property value risk. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.

4.3.6 Indicator 16: Climate Change Information

Justification for this indicator

Understanding the impacts of climate change requires access to climate change information. While institutions such Commonwealth Scientific and Industrial Research Organisation (CSIRO) and universities freely provide valuable publications on climate change risk and adaptation, obtaining climate change projections (e.g. from climate change models) is often a time consuming and expensive task, or one that can misalign with Council's timing needs. Council can obtain relevant climate change information from several sources including government databases, university/institutional relationships, desktop research, consultants and software (SimCLIM).

Understanding the information that goes into climate change models greatly helps the user understand the uncertainty associated with the climate modelling process. The differing greenhouse gas emissions scenarios, models chosen, downscaling and climate sensitivity can all yield differing results. This has the potential to confuse end-users at best and at worst lead to poorly informed decision making.

Staff survey results

The results also show that the City of Adelaide staff members recognise the role information can play as barriers and enablers to implementation of climate change adaptation actions. There were 64 staff members (28%) who identified a lack of information/ data as a barrier to climate change adaptation actions and 95 staff members (42%) who considered access to accessible and up-to-date information/data as an enabler. This supports respondents' preference of support tools for adapting to climate change impacts since 77% of respondents (172 staff members) believe that the provision of consistent, high-quality information, knowledge and tools about climate change is very helpful in adapting to climate change impacts. Similarly, localised climate data and information was found to be very helpful for 123 staff members (61%).

Respondents of the online survey identified the internet, traditional media, and social media as being the top three information sources commonly used by staff members to understand climate change impacts (see Figure 10). There are also a range of other information sources which Council staff members use including peak body associations, CSIRO, and someone in Council. It should be

noted that 28 staff members (12%) acknowledged that they do not look for information about climate change.

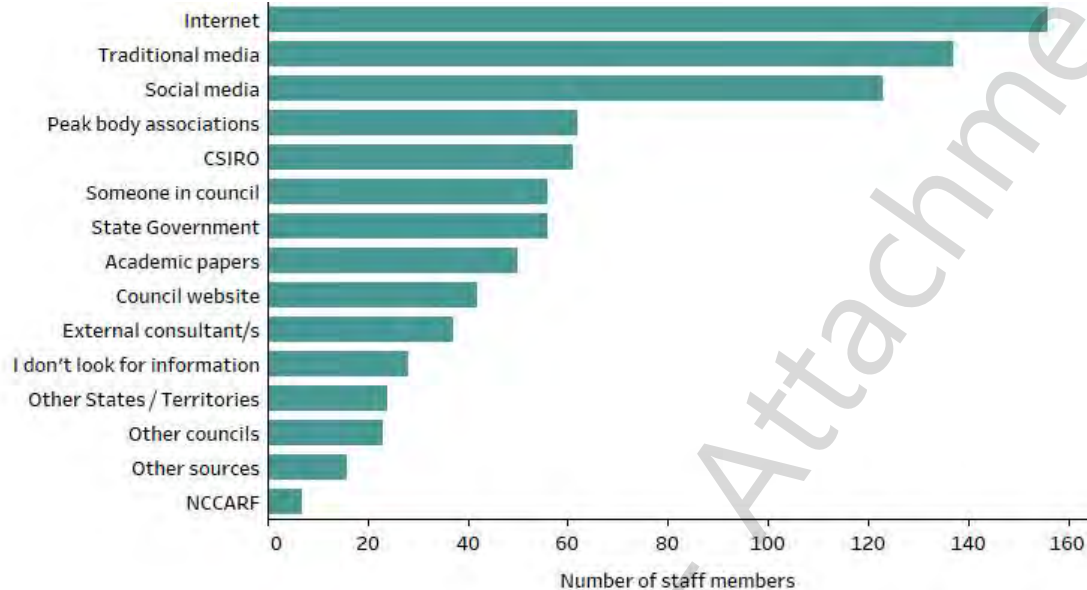


Figure 10: Information sources commonly used by the City of Adelaide staff members to understand climate change impacts

Staff members were also asked what types of information would help them to better incorporate climate change into their job. The two most popular responses were 'knowing what to actually do' (140 staff members, 63%) and knowing the 'anticipated impacts for my department' (57 staff members each, 57%). There were also 118 staff members (53%) who agreed that local climate projections/ forecasts would help in the implementation of climate change actions (see Table 17).

Table 17: Types of information which would help the City of Adelaide staff members incorporate climate change into job

	Number of staff members	% of staff members
Knowing what to actually do	140	63%
The anticipated impacts for my department	128	57%
Local climate projections / forecasts	118	53%
Knowing who to turn to for help	105	47%
Knowing who should be managing the issue in council	98	44%
Understanding what other councils are doing	97	43%
Knowing when we should start implementing adaptation actions	88	39%
Understanding the regulatory requirements	78	35%
Regional climate projections / forecasts	76	34%
Understanding potential trade-offs	71	32%
Knowing which level of government should be responsible for action	65	29%
Understanding legal implications	54	24%
Not sure	23	10%
Other	7	3%

	Number of staff members	% of staff members
None	3	1%

Qualitative assessment results

The City of Adelaide has used information about climate change from the IPCC, CSIRO, the Bureau of Meteorology, and various other scientific organisations, as presented and summarised in the Resilient East Regional Climate Change Adaptation Plan. This information is also being used as the basis of the current physical risk assessment. It was also noted that information such as the urban heat mapping has been used to build the business case for investment in greening, WSUD and inform discussion regarding materials selection.

At the face-to-face meetings, some staff stated that they were likely to have climate change information readily available but were unsure about which information they should be using. Staff members also acknowledged that a climate change policy would help direct staff to robust information sources including what type of climate projections information should be used.

Council has not made a formal whole-of-council decision regarding the sharing of information with the community or business owners regarding areas or assets that may be at higher risk due to climate change hazards.

Specific recommendations of the qualitative assessment

- 16.1 Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.

4.3.7 Indicator 17: Information Systems

Justification for this indicator

As the information technology age continues to shape our society it comes as no surprise to see that information services are playing an increasing role in supporting council operations and providing a new interface with the community it serves.

Information communication technology (ICT) networks such as social media platforms, websites and information portals have the potential to contribute significantly to Council's climate change adaptation ambitions. For example, ICT systems can be used for the monitoring and control of critical infrastructure and assets. According to a research report by Arup et al. (2013), 'improved monitoring and control capabilities for all infrastructure can enhance resilience by providing detailed and rapid information to utility managers and city leaders regarding operating conditions and performance'.

Furthermore, during extreme events, the ICT network are emerging as a natural agglomeration for concerned community members seeking information when disaster strikes. For example, Brisbane City Council maintains a social media hub (based on the social media aggregation site Stackla). This site became a main focal point for community engagement with Brisbane City Council and between residents who were able to upload information about the risks in real-time (Stackla, 2013).

Managing social media, however, requires constant attention as poor management of social media during extreme events can also cause confusion and do more harm than good.

Qualitative assessment results

Council's website was analysed for climate change and its integration with other information systems. The website includes working connections to six social media platforms including Facebook, Twitter, Instagram, LinkedIn, YouTube, and WeChat. Also, the website has a dedicated page for climate change which explains the projected climate trends for the City and shows projects Council are working on to respond to climate change, including the Resilient East Regional Climate Change Adaptation Plan. The City of Adelaide has also established an online community hub called 'Your Say Adelaide'. This website is a consultation hub where the community can engage with Council and have their voices heard about issues in the region.

The City of Adelaide has a Facebook account with 51,449 'likes' and 53,967 people following the page (as of February 2020). Council have also been a member of Twitter for 11 years (joined in February 2009) and in that time have gained 97,400 followers. These statistics show that Council has a high level of social media presence with considerable reach. There is a consideration of climate change in Council's posts which are focussed on awareness of climate-related hazards (i.e. heatwave) and Council's carbon emissions initiatives and targets and engagement for climate change community events. These results show that the City of Adelaide has actively communicated with the community about climate change issues. However, with such a large group of followers, there is an untapped potential for engagement which Council could utilise to improve community awareness on hazards and share information and build knowledge about climate change.

Specific recommendations of the qualitative assessment

- 17.1 Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.
- 17.2 Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.
- 17.3 Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.

5 Conclusions

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff

had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

6 References

- Arup, RMT & Siemens. (2013). *Toolkit for Resilient Cities: Infrastructure*. Technology and Urban Planning. Retrieved April 10, 2017, from <https://www.siemens.com/content/dam/internet/siemens-com/global/company/topic-areas/intelligent-infrastructure/resilience/toolkit-for-resilient-cities.pdf>
- Baker-Jones, M., Burton, D., Bell, J., & Chang Seng, D. (2013). *Climate change adaptation: Guided by the Law DLA Piper*. Retrieved April 10, 2017, from <http://www.dlapiper.com/files/Uploads/Documents/climate-change-adaptation-guided-by-the-law.pdf>
- City of Adelaide. (2016). *Adelaide Design Manual*. Retrieved 05 21, 2020, from <http://www.adelaidedesignmanual.com.au/>
- Clos, J. (2015). *From COP21 to the New Urban Agenda*. (U. Chronicle, Producer) Retrieved May 22, 2019, from <https://unchronicle.un.org/article/cop21-new-urban-agenda>
- Edwards, I., Burton, D., & Baker-Jones, M. (2017). *Governance Directions*. Feature Article - Risk Management. Retrieved March 2017
- Gardner, J., Dowd, A.-M., Mason, C., & Ashworth, P. (2009). *A framework for stakeholder engagement on climate adaptation*. CSIRO Climate Adaptation Flagship Working paper No.3. Retrieved April 10, 2017, from https://research.csiro.au/climate/wp-content/uploads/sites/54/2016/03/3_CAF_WorkingPaper03_pdf-Standard.pdf
- Government of South Australia. (2012). *Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia*. Retrieved May 21, 2019, from <https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/prospering-in-a-changing-climate-adaptation-framework-sa.pdf>
- Government of South Australia. (2016). *State Emergency Management Plan - Part 3: Guidelines and Frameworks*. Retrieved May 27, 2019, from https://www.dpc.sa.gov.au/__data/assets/pdf_file/0018/45702/Emergency-Management-Lessons-Management-Framework.pdf
- Government of South Australia. (2018). *About development plans*. Retrieved May 20, 2019, from <https://www.sa.gov.au/topics/planning-and-property/development-plans/guidance-and-application/about-accessing-development-plans>
- Government of South Australia. (2019). *Local Government Act 1999*. Retrieved May 20, 2019, from <https://www.legislation.sa.gov.au/LZ/C/A/LOCAL%20GOVERNMENT%20ACT%201999/CURRENT/1999.62.AUTH.PDF>
- Government of South Australia. (n.d.). *Planning, Development and Infrastructure Act 2016*. Retrieved May 20, 2019, from <https://www.legislation.sa.gov.au/LZ/C/A/PLANNING%20DEVELOPMENT%20AND%20INFRASTRUCTURE%20ACT%202016/CURRENT/2016.14.AUTH.PDF>
- Kim, B.-Y., & Kim, J. (2007). *Increasing Trust in Government through more Participatory and Transparent Government*. Presidential Committee on Government Innovation & Decentralization. Retrieved October 8, 2018, from <http://unpan1.un.org/intradoc/groups/public/documents/un/unpano31741.pdf>
- NCCARF. (2013). *Challenges of adaptation for local governments: Guidance Policy Brief Number 5*. Retrieved June 5, 2017, from

http://www.nccarf.edu.au/sites/default/files/attached_files_publications/GOVERNMENT_070313_A4.pdf

Productivity Commission. (2012). *Barriers to Effective Climate Change Adaptation*. Canberra: Report No. 59, Final Inquiry Report. Retrieved April 10, 2017, from <https://www.pc.gov.au/inquiries/completed/climate-change-adaptation/report/climate-change-adaptation.pdf>

Resilient East. (2016). *Resilient East Regional Climate Change Adaptation Plan 2016*. for the Eastern Region in association with the Government of South Australia and the Australian Government. Retrieved February 24, 2020, from https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/sector_agreements/sector-agreement-resilient-east-gen.pdf

Stackla. (2013). Brisbane Council, Cool in a Crisis. Retrieved April 10, 2017, from <http://stackla.com/project/brisbane-city-council-cool-in-a-crisis/>

TCFD. (2016). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Retrieved March 22, 2018, from <http://www.fsb.org/wp-content/uploads/Recommendations-of-the-Task-Force-on-Climate-related-Financial-Disclosures.pdf>

The City of Adelaide. (2015). *Carbon Neutral Strategy 2015-2025*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-carbon-neutral-2015-25.pdf?mtime=20190524100940>

The City of Adelaide. (2016). *Strategic Plan 2016-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-strategic-plan-landscape.pdf?mtime=20190509094049>

The City of Adelaide. (2019). *Integrated Business Plan 2019-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/plan-integrated-business-plan-2019-20.pdf?mtime=20190702122042>

7 Appendices

Appendix A: Questionnaire from staff governance survey

Introduction

The City of Adelaide are participating in a climate change governance assessment. This will help councils determine how they best respond to, or adapt, to climate change and manage current and future climate risks.

As part of the project we have prepared a very short (7 minutes max) survey, open to all staff. By agreeing to participate in the survey we will be able to generate more results that are tailored specifically for your Council and your department. The survey is anonymous.

Thanks for your time and if you have any questions please contact me directly on the details below.

Kindest regards,

Donovan Burton

donovan@climateplanning.com.au

Respondent Information

1. Which of the following best fits with YOUR department / job description? (multiple answers can be checked)

- | | |
|---|--|
| <input type="checkbox"/> Corporate Governance / Office of the CEO | <input type="checkbox"/> Water and Waste |
| <input type="checkbox"/> Customer Service | <input type="checkbox"/> Works |
| <input type="checkbox"/> Workplace Health and Safety | <input type="checkbox"/> Environment / Sustainability |
| <input type="checkbox"/> Human Resources | <input type="checkbox"/> Disaster / Emergency Management |
| <input type="checkbox"/> Finance | <input type="checkbox"/> Community and Recreation |
| <input type="checkbox"/> Assets | <input type="checkbox"/> Arts & Heritage |
| <input type="checkbox"/> Information Technology (IT) Services | <input type="checkbox"/> Fleet |
| <input type="checkbox"/> Geographic Information Systems (GIS) | <input type="checkbox"/> Procurement |
| <input type="checkbox"/> Communications, Media and Marketing | <input type="checkbox"/> Casual (no specific department) |
| <input type="checkbox"/> Planning and Development | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Engineering / Infrastructure | _____ |

2. Please rate YOUR understanding of climate change impacts and adaptation for your department/ job description (only one answer can be checked)

- ☐ I am not sure of my understanding
- ☐ I have no understanding
- ☐ My understanding is limited (I would need some support incorporating climate change adaptation into my tasks)
- ☐ I could comfortably incorporate/ consider climate change adaptation into any of my tasks

Climate Change Adaptation in your Department

3. How serious an issue do YOU think climate change is for your department? (only one answer can be checked)

- ☐ Unsure
- ☐ No issue
- ☐ Minor issue
- ☐ Somewhat - but not urgent
- ☐ Important issue that needs attention now

4. Does YOUR department use climate change risk assessments to inform decision making? (only one answer can be checked)

- ☐ Yes
- ☐ Sometimes
- ☐ No
- ☐ Unsure

Climate Change Adaptation in your Council

5. In YOUR opinion, what is your council's level of preparedness for responding to climate change impacts? (only one answer can be checked)

- ☐ Not sure
- ☐ Not prepared at all
- ☐ Not very prepared
- ☐ Fairly prepared
- ☐ Very prepared

6. When do YOU think climate change will impact your council's operations and procedures? (only one answer can be checked)

- ☐ Now - It has already had an impact
- ☐ Short term - In the next year
- ☐ Medium term - Within 15 years
- ☐ Long term - by 2050
- ☐ Very long term - by 2070 - 2100
- ☐ Never
- ☐ Not sure

Barriers to Council Adaptation

7. In your opinion, which of these BARRIERS currently hinder your council's ability to plan for climate change? (multiple answers can be checked)

- | | |
|--|--|
| <input type="checkbox"/> Limited assigned funding | <input type="checkbox"/> Lack of information /data |
| <input type="checkbox"/> Limited staff capacity (number of) | <input type="checkbox"/> Uncertain where to start |
| <input type="checkbox"/> Limited staff capability (skills) | <input type="checkbox"/> Dealing with other government agencies |
| <input type="checkbox"/> Confusing/changing policy at different levels of government | <input type="checkbox"/> Apprehensive about legal risk |
| <input type="checkbox"/> Lack of political will | <input type="checkbox"/> Lack of training and learning opportunities for staff |
| <input type="checkbox"/> Not seen as a priority by the community | <input type="checkbox"/> Not seen by management / executive as a priority |
| <input type="checkbox"/> Limitations in legislation and regulation | <input type="checkbox"/> Risks are not well understood |
| <input type="checkbox"/> Uncertainty of the role of Local Government | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Lack of organisational support | _____ |

8. In your opinion, which of these ENABLERS contribute to your council's ability to plan for climate change? (multiple answers can be checked)

- | | |
|--|--|
| <input type="checkbox"/> Senior management support | <input type="checkbox"/> External agency support |
| <input type="checkbox"/> Understanding of cost/benefits of climate change adaptation actions | <input type="checkbox"/> Peer to peer learning (e.g. through Greenhouse Alliance and other networks) |
| <input type="checkbox"/> Active and engaged communities | <input type="checkbox"/> Training opportunities |
| <input type="checkbox"/> Mayor/ councillor leadership | <input type="checkbox"/> Effective risk management practices |
| <input type="checkbox"/> External funding | <input type="checkbox"/> Good understanding of climate change |
| <input type="checkbox"/> Assigned staff responsibilities | <input type="checkbox"/> Accessible and up to date information/ data |
| <input type="checkbox"/> Duty of care | <input type="checkbox"/> Legislative / policy change at State level |
| <input type="checkbox"/> Avoiding future unbudgeted costs | <input type="checkbox"/> State Government support |
| <input type="checkbox"/> Regional coordination | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Liability concerns resolved | _____ |
| <input type="checkbox"/> Staff champions | |

Level of Climate Change Adaptation Support

9. How HELPFUL are the following types of support in adapting to climate change impacts?

	Not helpful	Fairly helpful	Very helpful	Not sure
Provision of consistent, high quality information, knowledge and tools about climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guidance on risk assessment and reducing risk exposure for councils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Localised climate data and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internal policies that direct action on climate change (e.g. a climate change policy)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specific ongoing resource allocation for climate change projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State government statutory planning support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capacity building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Case studies in effective adaptation planning, strategies and implementation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordination with the South Australian Government effort to adapt to climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-statutory planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Education and community engagement tools and strategies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public statements of leadership and action from the State Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A climate change bridging organisation (e.g. A coordinating body for research, training, networking, guidelines etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sourcing Climate Change Information

10. Where do YOU get your information about climate change impacts? (multiple answers can be checked)

- | | |
|--|---|
| <input type="checkbox"/> I don't look for information | <input type="checkbox"/> Other councils |
| <input type="checkbox"/> Academic papers | <input type="checkbox"/> External consultant/s |
| <input type="checkbox"/> Traditional media (e.g. newspapers, news) | <input type="checkbox"/> Peak body associations |
| <input type="checkbox"/> Social media (e.g. Facebook, Twitter, LinkedIn) | <input type="checkbox"/> NCCARF |
| <input type="checkbox"/> Internet | <input type="checkbox"/> CSIRO |
| <input type="checkbox"/> Council website | <input type="checkbox"/> State Government |
| <input type="checkbox"/> Someone in council | <input type="checkbox"/> Other States / Territories |
| | <input type="checkbox"/> Other (please specify) |

11. What type of information about climate change impacts would help YOU incorporate climate change into your job? (multiple answers can be checked)

- ☐ None
 - ☐ Not sure
 - ☐ Local climate projections / forecasts
 - ☐ Regional climate projections / forecasts
 - ☐ The anticipated impacts for my department
 - ☐ Knowing when we should start implementing adaptation actions
 - ☐ Knowing what to actually do
 - ☐ Knowing who should be managing the issue in council
 - ☐ Understanding legal implications
 - ☐ Understanding the regulatory requirements
 - ☐ Knowing which level of government should be responsible for action
 - ☐ Understanding potential trade-offs
 - ☐ Knowing who to turn to for help
 - ☐ Understanding what other councils are doing
 - ☐ Other (please specify)
-

Climate Change Adaptation Training

12. Have YOU had any training for climate change adaptation? (multiple answers can be checked)

- ☐ None
 - ☐ Yes - a university or TAFE subject
 - ☐ Yes - a university Degree / Masters / PhD in climate adaptation
 - ☐ Yes - a university diploma / certificate in climate adaptation
 - ☐ Yes - from a peak body training package (e.g. Planning Institute of Australia or Engineers Australia)
 - ☐ Yes - from a consultant
 - ☐ Yes - from the Enhanced Local Government Service Delivery Course (Australian Centre for Excellence in Local Government)
 - ☐ Other (please specify)
-

Questions

13. Are there any other comments you would like to make about adapting to climate change in your council?

14. Would you like to be kept informed about the progress and outcomes of this project?

- ☐ No
☐ Yes (please type your email address)

Appendix B: List of keywords used for quantitative assessment

Theme	Definition/ Keywords
Climate change	Council documents were searched for keywords associated with climate change. These keywords include 'climate change', 'global warming' and 'climate variability'.
Sea level rise*	Council documents were searched for keywords associated with sea level rise. These keywords include 'sea level rise' and 'sea level change'.
Adaptation	Council documents were searched for keywords associated with adaptation. These keywords include 'adapt', 'adaptation', 'adaptive' and 'adaptability'.
Greenhouse gas emissions	Council documents were searched for keywords associated with greenhouse gas emissions. These keywords include 'greenhouse gas', 'GHG', 'carbon emission', 'carbon footprint', 'carbon neutral', 'carbon neutrality', and 'net zero'.

* only relevant for coastal councils

Appendix C: Questions used in the qualitative governance assessment

Consultants asked representatives of the City of Adelaide the following questions during face-to-face meetings for the qualitative governance assessment.

Indicator 11: Climate Risk Assessments

1. What do you perceive as council's key climate change risks?
2. Is council undertaking any other climate change risk assessments?
 - a. If yes, can you elaborate?
3. Does Council have a risk register, if so can you provide us a copy?
 - a. If no, can you please search the document to check if climate change is considered and copy the relevant sections?

Indicator 12: Climate Legal Risk

4. Has council sought independent legal advice regarding specific climate change issues?
 - a. If so, for which issues?
5. Have your insurers asked you to provide any specific information about how you manage climate change risks?
6. Has council had any litigation based on climate-related hazards (either direct or indirect impacts)? For example, extreme weather causing damage and death or sea wall causing injury or death.
7. In regard to land use planning, has council refused any developments because of climate change risks?

8. In regard to land use planning, has council had to go to court or a tribunal for any climate change and planning issues (e.g. related to development applications)?

Indicator 13: Staff Capacity and Resource Allocation

9. Does council have somebody specifically responsible for climate change adaptation (e.g. climate change adaptation officer)?
 - a. If so, what is their full-time equivalent (FTE)?
10. Does council have any programs/ policies that mandate climate change training for staff?
11. Have staff have had any training in climate change adaptation?
12. Are there any instances where your staff have applied their skills to climate change adaptation activities or projects?
13. Is there a budget allocated for up-skilling staff in climate change adaptation?

Indicator 14: Community/ Stakeholder Engagement

1. Does council have a climate change communication strategy (both internally and externally)?
2. Does council have Community Plan or Strategy?
 - a. If so, is climate change considered?
3. Has council engaged the community on climate change issues?
 - a. If so, what methods of communication do you use to engage the community (e.g. project specific meetings, face-to-face, social media)?
 - b. Were the community receptive?
4. Does council have any active community or business working groups for climate change that council facilitates?

Indicator 15: Institutional/ Intergovernmental Relationships

5. Is council involved in any **local, regional and State working groups** for climate change (e.g. C-CAT, LGAQ project, Regional Organisation of Councils, local working group, utilities working group)?
 - a. How often do you meet?
 - b. What is the purpose of the working group (e.g. information sharing, political lobbying)?
 - c. Do you collaborate on projects?
 - d. Do you have MOUs and/or formal agreements?
6. Is council involved in any **federal working groups** for climate change (e.g. NCCARF)?
 - a. How often do you meet?
 - b. What is the purpose of the working group (e.g. information sharing, political lobbying)?
 - c. Do you collaborate on projects?
 - d. Do you have MOUs and/or formal agreements?

Indicator 16: Climate Change Information

7. What sources of climate change information does Council use to guide decision making on climate change?
8. What climate data do you base Council decisions on (e.g. IPCC fifth assessment report, BOM)?
9. What systems do you have in place to ensure the data is up-to-date?
10. Do you have an Open Data Strategy?
 - a. If so, is climate data considered?

Indicator 17: Information Systems

11. Does Council have an active social media presence (e.g. Facebook, Twitter)?
12. Do Council's social media posts communicate or discuss climate change issues?
13. Does Council share its data with external online databases (e.g. data.gov.au)?
 - a. If so, how many datasets are available?
14. Does Council have a formal performance management system?
15. Does Council have any key performance indicators for managing climate change?
16. Does Council measure the number of properties exposed to certain risks?
17. Does Council measure how much each disaster costs for clean up?
18. Are there any other climate-related factors which Council measure in their performance management?
19. Do council undertake any big data analytics for climate change issues (e.g. number of people tweeting about heatwaves, paying third party to analyse accommodation during heatwaves, analysing Facebook likes for climate-related postings)?
20. Has the management of climate change been included in any community projects (e.g. hack-a-thons)?
 - a. Please explain the projects and what the outcomes were?

Appendix D: Key terminology used in the quantitative assessment

Terminology	Definition
Climate change adaptation issues	Issues related to climate change adaptation. They include the following: natural disasters, extreme weather, rainfall, heatwaves, sea level rise, bush fire, flooding, cyclones, storms, storm tide, erosion, drought, earthquake and landslide. These are only issues if they are specifically in the context of climate change (e.g. increased extreme rainfall intensity). This list only represents some of the climate change adaptation issues that can arise and is for indicative purposes only.
Climate change mitigation issues	Issues related to climate change mitigation. Examples of these may include emissions reduction, greenhouse gas emissions, carbon footprint, carbon emissions, carbon neutral, carbon neutrality, carbon sequestration, carbon dioxide (CO ₂), carbon dioxide equivalent (CDE), CO ₂ e, CO ₂ eq, carbon capture and storage (CCS), energy efficiency, net zero, carbon credits, carbon price, carbon tax, Emissions Trading Scheme (ETS), Carbon Pollution Reduction Scheme (CPRS), Renewable Energy Target (RET), Representative Concentration Pathways (RCP), Emissions Reduction Unit (ERU). This list only represents some of the climate change mitigation issues that can arise and is for indicative purposes only.
Climate change risks	Types of risks associated with climate change. Examples of these may include infrastructure risk, policy risk, market and competitiveness risk, climate legal risk, environmental risk, community risk, political risk, economic risk, financial risk, insurance risk. This list only represents some of the climate change risks that can arise and is for indicative purposes only.
Direct impacts (From acute and chronic physical impacts)	Direct impacts are impacts which are directly associated with any of the climate change issues. Examples of direct climate change impacts include damage to assets from storm surge, loss of life as a result of increased heatwaves etc. This list only represents some of the direct impacts that can arise and is for indicative purposes only.
Indirect impacts (From acute and chronic physical impacts)	Indirect impacts are impacts which are an indirect result of a climate change issue. Examples of indirect climate change adaptation impacts include: changes to insurance availability and affordability, increased mortgage risk, supply chain impacts, disease and disease vector changes, food insecurity, market shift, decreased rateable value, regulatory change, decreased credit ratings. This list only represents some of the indirect impacts that can arise and is for indicative purposes only.
Documents	<p>Documents is a collective term used to identify a group of different document types reviewed in the assessment. These documents types include, but are not limited to: policies, strategies, plans, frameworks, guidelines, and procedures.</p> <p>For example, the term 'financial management documents' was used to refer to the following documents which were assessed for the Financial Management indicator:</p> <ul style="list-style-type: none"> • Financial management policy • Financial management strategy • Financial management plan
Council function	A council function is a key function which Council provides. Examples of specific council functions include: land use planning, emergency management, natural environment, biodiversity, health and wellbeing, asset management, compliance, works, waste management, sewerage, potable water, community engagement. Please note that some councils do not undertake all of these functions.

Terminology	Definition
Planning theme	A planning theme is a topic which represents the policy intent of a Council's regulatory planning document (i.e. Planning Scheme, Development Plan). Examples of planning themes include: sustainability and resilience, natural environment and landscape, strong communities, settlement patterns, natural resources, integrated transport, infrastructure, water management, coastal areas, hazards etc.
Prescribed response	A prescribed response is an authoritative guide, direction or action on a specific issue or topic. For example, a prescribed response may include a template or guideline of how climate change adaptation should be actioned (i.e. analyse, plan, allocate resources, implement and monitor, evaluate and report).



Confidential Items

9. Confidential Item 11.1 - Corporate Climate Change Risk Assessment [2019/01119] [AC]

Discussion ensued during which Councillor Couros left the Colonel Light Room at 10.04 am.

It was then –

Moved by Mr Haslam,

Seconded by Ms Davies –

THAT THE AUDIT COMMITTEE

1. Notes the report and the *Climate Change Risk Assessment Report* as shown in Attachment A to Item 11.1 on the Agenda for the meeting of the Audit Committee held on 7 August 2020.
2. In accordance with Section 91(7) & (9) of the *Local Government Act 1999* and on the grounds that Item 11.1 [Corporate Climate Change Risk Assessment] listed on the Agenda for the meeting of the Audit Committee held on 7 August 2020 was received, discussed and considered in confidence pursuant to Section 90(3)(b) and (d) of the *Local Government Act 1999*, this meeting of the Audit Committee, do order that:
 - 2.1. The report, the discussion and any other associated information submitted to this meeting and the Minutes of this meeting in relation to the matter remain confidential and not available for public inspection until 31 December 2027.
 - 2.2. The confidentiality of the matter be reviewed in December 2021.
 - 2.3. The Chief Executive Officer be delegated authority to review and revoke all or part of the order herein and directed to present a report containing the Item for which the confidentiality order has been revoked.

Carried

Item 11.1, distributed separately, is attached for reference below.

Corporate Climate Change Risk Assessment

ITEM 11.1 07/08/2020
Audit Committee

Strategic Alignment - Environmental Leadership

2019/01119

Confidential - s 90(3) (b) & (d) commercial advantage/prejudice commercial position of council/commercial information of a confidential nature

Program Contact:

Michelle English, AD Economic Development and Sustainability
82037687

Approving Officer:

Ian Hill, Director Growth

EXECUTIVE SUMMARY:

The City of Adelaide has undertaken an organisation-wide corporate climate risk assessment. The *Climate Change Risk Assessment Report* uses up-to-date climate modelling and considers governance and risk frameworks. The risk assessment included a review of climate change adaptation governance, the physical risks to assets and services, as well as transition risks and opportunities facing the organisation as a result of climate change.

The primary objective was to identify, review and assess climate change risks to assets, operations and services. By combining multiple methodologies to assess climate risk, this report presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. This report outlines the findings of the risk assessment and its recommended priority next steps.

It is proposed that a climate change adaptation action plan will be undertaken to address the findings of the Assessment Report and that it will be overseen by a cross-program steering group. This is proposed to be funded through the Climate Change Action Initiatives Fund in 2020/21.

It is recommended this report is considered by the Audit Committee in confidence as it provides information regarding potential risks for the City of Adelaide for which actions to mitigate the risks have yet to be further considered by Council.

RECOMMENDATION:

THAT THE AUDIT COMMITTEE

1. Notes the report and the *Climate Change Risk Assessment Report* as shown in Attachment A to Item 11.1 on the Agenda for the meeting of the Audit Committee held on 7 August 2020.
2. In accordance with Section 91(7) & (9) of the *Local Government Act 1999* and on the grounds that Item 11.1 [Corporate Climate Change Risk Assessment] listed on the Agenda for the meeting of the Audit Committee held on 7 August 2020 was received, discussed and considered in confidence pursuant to Section 90(3)(b) and (d) of the *Local Government Act 1999*, this meeting of the Audit Committee, do order that:
 - 2.1. The report, the discussion and any other associated information submitted to this meeting and the Minutes of this meeting in relation to the matter remain confidential and not available for public inspection until 31 December 2027.
 - 2.2. The confidentiality of the matter be reviewed in December 2021.
 - 2.3. The Chief Executive Officer be delegated authority to review and revoke all or part of the order herein and directed to present a report containing the Item for which the confidentiality order has been revoked.

IMPLICATIONS AND FINANCIALS:

CoA 2020-2024 Strategic Plan	Strategic Alignment – Environmental Leadership The City of Adelaide 2020-2024 Strategic Plan includes an objective to be a 'climate ready organisation and community'.
Policy	Not as a result of this report
Consultation	Internal consultation has been undertaken across the organisation to inform the report, including input from over 250+ staff and management.
Resource	Not as a result of this report
Risk / Legal / Legislative	The City of Adelaide (CoA) has exposure to physical risks, transition risks and liabilities related to climate risks. These include physical climate risks to assets and services, transition risks to business functions and liability risks from governance, information disclosure and planning decisions. This report informs CoA's risk exposure to climate change.
Opportunities	The report indicates that there are opportunities for the City of Adelaide to more fully integrate climate risk into its strategic planning, financial management, public risk disclosure, asset management, land use planning, emergency management and climate change policy.
20/21 Budget Allocation	It is proposed that a Climate Change Adaptation Action Plan responding to climate risks identified in this report will be undertaken in 2020/21. The cost of this work is \$35,000 and will be funded by the Climate Change Action Initiatives Fund.
Proposed 21/22 Budget Allocation	Not as a result of this report
Life of Project, Service, Initiative or (Expectancy of) Asset	Not as a result of this report
20/21 Budget Reconsideration (if applicable)	Not as a result of this report
Ongoing Costs (eg maintenance cost)	Not as a result of this report
Other Funding Sources	The Climate Change Risk and Governance Assessment report was co-funded (\$24,000) by the Local Government Association Mutual Liability Scheme (LGAMLS). This collaboration sought a sector based and useful tool for all LGAMLS members which will be made available as a physical risk template. CoA will investigate whether the Risk Incentive funding in October could be used to fund the Climate Change Adaptation Action Plan.

GROUNDINGS AND BASIS FOR CONSIDERATION IN CONFIDENCE

Grounds

This Item is confidential because the report outlines information on potential climate change risks and opportunities associated with City of Adelaide assets (key businesses, sites and infrastructure) and services. These risks include potential physical, financial, transition and legal liability matters that are yet to be fully investigated with appropriate mitigation measures implemented. Disclosure of this information could prejudice the City of Adelaide's commercial position in consideration of this risk mitigation.

Basis

This Item is confidential in nature because the report includes information on potential risks for which Council has yet to determine mitigations strategies.

Disclosure of this information could prejudice the City of Adelaide's commercial position.

Public Interest

The Audit Committee is satisfied that the principle that the meeting be conducted in a place open to the public has been outweighed in the circumstances because the disclosure of this information relates to a potential risk for Council's commercial position in risk mitigation considerations.

DISCUSSION

Background

1. The City of Adelaide (CoA) has considered the risk implications of climate change since 2009, when it participated in the LGA Mutual Liability Scheme's Local Government Climate Change Adaptation Program. This work included the development of a climate risk register which later informed the development of the CoA's *Climate Change Adaptation Action Plan 2011-2013* and the updated *Climate Change Adaptation Action Plan 2013-15*.
2. More recently, the CoA has focused predominantly on community climate risk exposure and adaptation, through its participation and coordination of the Resilient East Project, a collaboration with seven other eastern Adelaide metropolitan Councils. This collaboration resulted in the development of the *Resilient East Integrated Vulnerability Assessment Report* and *Regional Climate Change Adaptation Plan*.
3. The CoA has also been working on the implementation of climate adaptation priority areas, such as Hot Hot Hot! (preparing our community for the challenges posed by extreme weather), Water Sensitive Urban Design, Urban Greening, Reducing Urban Heat (heat mapping and Cool Road Adelaide trials) and planning submissions.
4. On two occasions, in June 2018 and August 2019, Sarah Barker, Special Counsel Minter Ellison presented to Council Members and Administration on the corporate governance, financial and liability implications of climate change risk.
5. At the Council Committee meeting in June 2018 Council indicated support for a corporate climate risk assessment to be undertaken to identify exposure of the organisation to physical, economic transition and liability risks.
6. In October 2018, the Audit Committee requested that a report on CoA's approach to climate risk be brought back to the Committee.
7. A report was presented to the Audit Committee in May 2019 which included a high-level outline of the corporate governance, financial and liability implications of climate change risk, including CoA's work to date and planned future work.
8. On 15 August 2019, the Audit Committee received a Corporate Climate Change Risk Presentation and noted that the CoA would commence a Climate Change Risk and Governance Assessment report. The Audit Committee requested that the Assessment be brought back to the Audit Committee.
9. In late 2019, the CoA invited the Local Government Association Mutual Liability Scheme (LGAMLS) to collaborate and co-fund the climate risk assessment. The LGAMLS has co-funded the project with the understanding that a brief guide and physical risk templates are made available to other local government authorities.

Global Trends – Assessing Climate Risk

10. Climate risk continues to grow on the global scale. The World Economic Forum identifies climate change in the top 10 global risks in terms of likelihood, and the top 10 global risks in terms of impact, “Severe threats to our climate accounted for all the Global Risks Report’s top long-term risks”, explicitly on “extreme weather events with major damage to property, infrastructure and loss of human life and failure of climate-change mitigation and adaptation by governments and businesses”.
11. While the CoA’s climate risk assessment commenced before COVID-19, pandemics and climate risk are similar in that they both represent *physical shocks*, as they translate into an array of socioeconomic impacts. Physical shocks can only be remedied by understanding and addressing the underlying physical causes. Both are *systemic*, in that their direct manifestations and their knock-on effects propagate fast across an interconnected world. Both pandemics and the climate change require the same fundamental shift from optimising for short term performance to long term resilience.
12. In April 2015, the G20 Finance Minister and Central Bank Governors requested that the Financial Stability Board (FSB) review how the financial sector accounts for climate related issues resulting in a common international disclosure framework. The FSB established an industry led Task Force on Climate Related Financial Disclosures (TCFD), chaired by Michael Bloomberg.
13. In June 2017, the TCFD released recommendations on the disclosure of climate risk to provide investors, lenders, and insurance underwriters with information to appropriately assess climate-related risks and opportunities and ensure the efficient allocation of capital. The TCFD categorised climate related risks into two major categories, risks related to the transition to a lower-carbon economy (e.g. policy and legal risk, technology, market and reputation risks) and risks related to the physical impacts of climate change.

Recent National Trends - Climate Risk

14. On 24 February 2020, the Australian Prudential Regulation Authority (APRA) published a letter to all APRA-regulated institutions outlining plans to develop a prudential practice guide focused on climate-related financial risks, as well as a climate change vulnerability assessment. Consultation on the new prudential practice guide is expected to commence in mid-2020 with its publication before the year’s end. APRA currently supervises institutions holding \$6.5 trillion in assets for Australian depositors, policy holders and superannuation fund members.
15. The 2019-20 devastating bushfires were exacerbated by drought conditions, very dry vegetation and soils, and record-breaking heat. They illustrated escalating climate risks that will continue to threaten livelihoods and well-being. The fires caused 33 deaths, destroyed more than 3,000 homes, and burned more than 10 million hectares of bushland. This type of disaster was predicted by the Bureau of Meteorology several decades earlier as a result of climate change.
16. In June 2020, for the first time, leading Australian experts in both physical climate change science and disaster modelling are working together with Australian financial institutions to provide consistent and comparable financial disclosure guidelines under TCFD recommendations for producers and users of such guidelines in the form of the Climate Measurement Standards Initiative (CMSI). The CMSI is led and funded by the National Australia Bank, the Commonwealth Bank of Australia, Westpac, Suncorp, QBE and IAG among others, and will draw its scientific expertise from the Earth Systems and Climate Change Hub, a partnership of five universities, the CSIRO and the BoM. This initiative is aimed at creating a common understanding of the physical risks from climate change and providing projections for future repair and replacement costs of residential and commercial buildings and infrastructure.

City of Adelaide Climate Change Risk Assessment 2020

17. The report, *Climate Change Risk Assessment Report* has now been finalised by consultants, Edge Environment and Climate Planning. The report identifies the CoA’s exposure to physical, transition and governance risks associated with climate change. A copy of the report is provided in **Attachment A**.
18. The *Climate Change Risk Assessment Report* (the Assessment) draws upon the previous research, risk assessments and plans undertaken by the CoA, including the *Climate Change Adaptation Report 2009 – Adelaide* (LGA Mutual Liability Scheme), *Climate Change Adaptation Action Plan 2011-2013*, *Climate Change Adaptation Action Plan 2013-15* and *Risk Management Operating Guidelines*, as well as the *Regional Climate Change Adaptation Plan 2016* and *Integrated Vulnerability Assessment* undertaken as part of the Resilient East collaboration.

19. The CoA considered emerging frameworks for the climate risk assessment, such as the TCFD, updated ISO 13001 and AS 5334—2013 frameworks (Climate change adaptation for settlements and infrastructure—A risk-based approach). This methodology enables benchmarking and includes organisational engagement to collect on-the-ground information from the staff that best understand their services and assets, and confirming the risks identified against their areas of responsibilities. Refer to Figure 1 below.

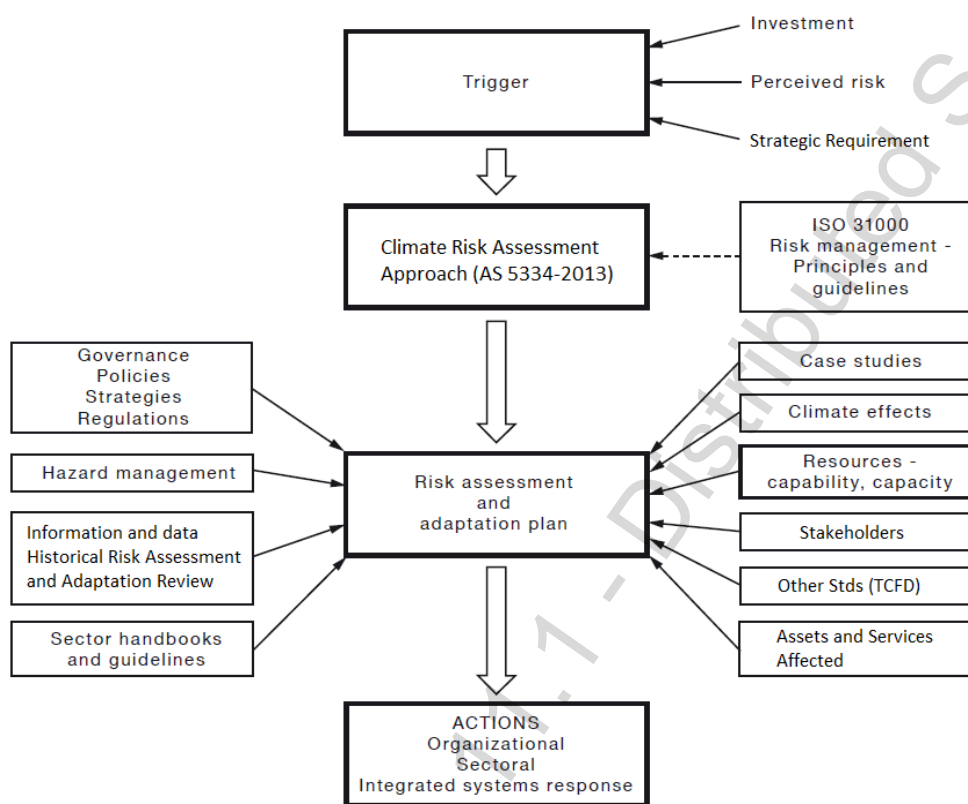


Figure 1 Adapted approach to Developing Climate Change Risk Assessment and Adaptation (AS 5334-2013)

20. The Assessment covers the following key aspects:
- 20.1. Identification and review of climate risks related to governance, services and assets
 - 20.2. Analysis of climate risk management (of existing and potential control measures)
 - 20.3. Risk management opportunities for climate risks (including prioritisation of risks)
 - 20.4. Disclosure (and controls measures) of climate risks.

Governance Risk Assessment

21. The Assessment identified Council's key publicly available corporate documents and involved a comprehensive analysis into how climate change is considered in decision making.
22. A key finding in relation to climate change governance was that CoA has a highly skilled staff base and is well-placed to become a national leader in the identification and management of climate change risks. Formal incorporation of climate change risk in the corporate risk management framework would deliver significant increases in CoA's climate governance risk measures.
23. Edge Environment consultancy utilised an established governance risk assessment tool (Informed.City™), which has been used by over 350 councils across Australia. The Assessment was informed by over 250 staff surveys and 10 workshops, as well as a document review of publicly available policies, planning documents and strategies. The Assessment included ten quantitative indicators, including four indicators that did not achieve a score. A summary of the scores against each indicator and evaluation of the CoA climate change adaptation governance is provided in Figure 2.

24. Ten Governance Climate Risk Indicators are rated from 0-4 scale, from 0 being non-existent, to 4 being advanced.

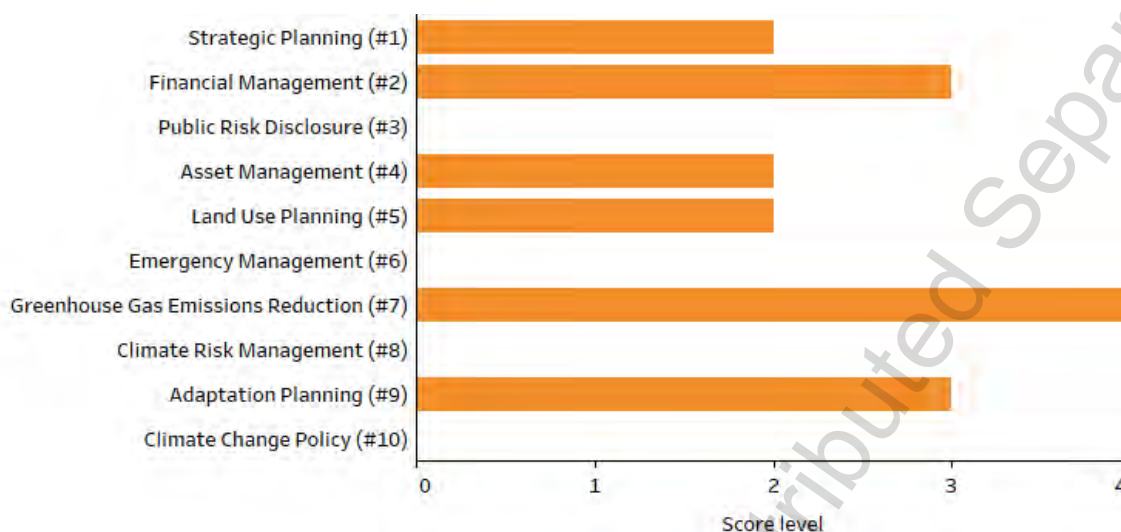


Figure 2 Governance indicator scores

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Detailed inclusion of climate change but is limited to two climate change issues AND/OR two council functions.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue AND/OR one council function only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) corporate climate change adaptation policy was found.

Table 1 Quantitative evaluation for climate change adaptation governance

Physical Risk Assessment

25. The physical climate risk assessment refers to the risks arising from the physical effects of climate change on operations, workforce, infrastructure, assets and services.

26. The physical risk assessment aligned with Risk Management Standard (ISO 13001) and was informed by interviews with 28 team leaders and managers, a review of all assets and services and short and long-term projections of climate change. The approach is summarised in Figure 3.

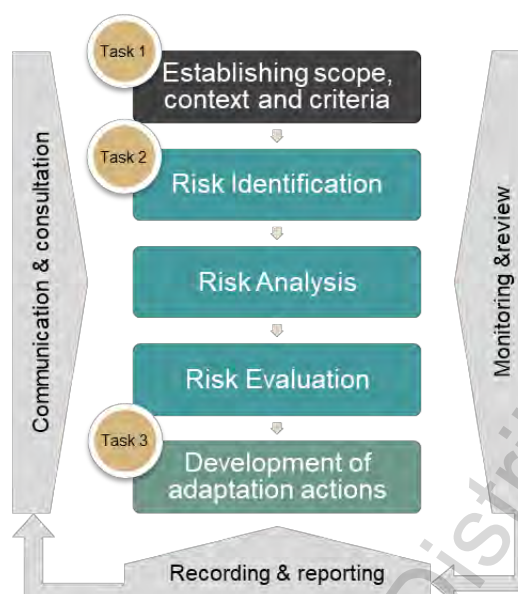


Figure 3 The climate risk assessment framework (adapted from ISO31000:2018)

27. Through the assessment, 283 individual risks to the CoA were identified. Over three quarters of the risks identified in this assessment were associated with the following climate variables:

27.1. Temperature: including both average temperatures increase as well as the increased frequency of very hot days and heatwaves; and

27.2. Rainfall: including changing rainfall patterns, extreme rainfall and flooding events.

28. Figure 4 illustrates the proportion of climate risks related to each climate variable.

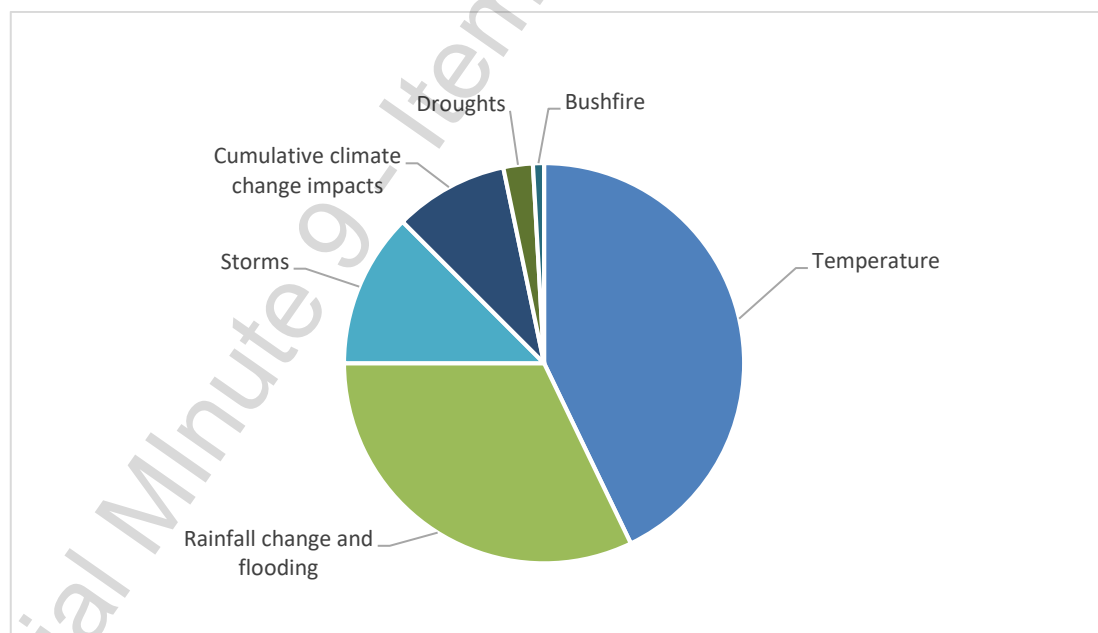


Figure 4 Proportion of climate risks by climate variable

29. Physical climate related risks common across all asset and service categories were:

29.1. Impacts of heat on people and the ability to deliver Council services, the reduction of people coming to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.

29.2. Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, roads, or the golf links.

- 29.3. Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.
30. The highest physical risks related to CoA assets and service categories include the following, highlighted by key sites and services:
- 30.1. Key sites - Across all key sites, Adelaide Town Hall and UParks were identified as having the highest number of risks in total, followed by Rundle Mall, the Central Market and Golf Links. None of these had extreme risks for 2030, but all had a combination of high and extreme risks by 2090.
 - 30.2. Parkland and open space assets - Several high risks were identified, including the increased mortality of trees and other vegetation on very hot days and resultant urban heat island implications, which was evaluated as a high risk for 2030 and an extreme risk for 2090.
 - 30.3. Infrastructure - One extreme risk was identified for the short term, related to the stormwater and drainage network and was associated with eight extreme risks in 2090. Roads were also associated with high risks at 2030 and 2090.
 - 30.4. Services - The services category had the highest number of individual risks across all groups, with 106 risks in total. High and extreme risks were common for cleansing (streets, toilets), events, community grants, homeless support, library services, horticulture, planning and building.

Risk ratings Asset or service grouping	2030				2090			
	L	M	H	E	L	M	H	E
Buildings	3	1	0	0	2	2	0	0
Parkland and open space assets	0	4	4	0	0	4	3	1
Infrastructure	13	21	22	4	8	11	29	12
Other	0	1	1	0	0	1	1	0
Key sites	28	38	32	0	17	34	40	7
Service group	15	42	48	1	4	24	59	19

Table 2. Total number of physical risks by asset or service grouping and risk rating across two timescales.

31. While this climate risk assessment does not represent a climate adaptation plan, putting in place control measures to mitigate risks could halve higher risks in the near term, and reduce the severity of nearly all extreme risks in the longer term.

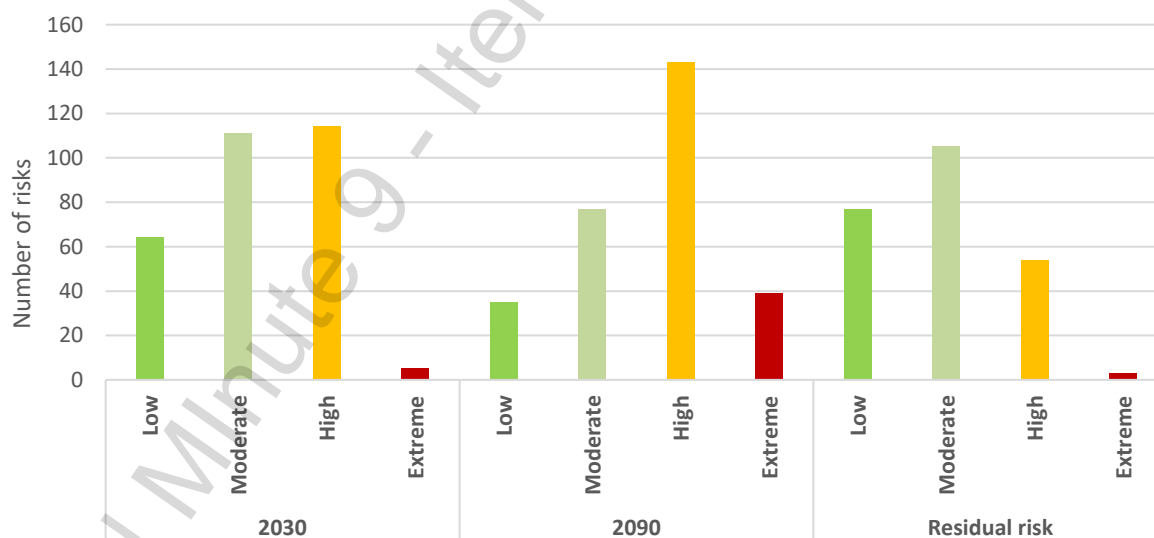


Figure 5. Total number of risks by time period and rating.

32. Liability measures – A range of liability risks were identified during the assessment, however, in the absence of independent legal opinion the extent of the legal liability risk cannot be quantified. It is recommended that Council consider obtaining legal advice regarding medium to extreme liability risks, especially in regard to the potential impacts from flooding.

Transition Risk Assessment

33. Transition risks result from the shift to a low carbon economy include those associated with policy; regulation; technology; markets and business models; and reputation and confidence. The key aim of a transition risk assessment is to identify and address climate transition risks and opportunities. A summary of highly ranked transition risk and opportunities include:
 - 33.1. The Aquatic Centre has a high transition risk related to the gas-powered heating of the pool infrastructure.
 - 33.2. CoA businesses are reliant on shifting markets including tourism and the international student market due to reliance of carbon intensive air travel. It was identified that market changes in travel could drive the need for shifts in the city's revenue model.
 - 33.3. The Fleet is exposed to carbon emissions trading schemes.
 - 33.4. An integrated approach to carbon reduction initiatives is needed. It was noted that fleet and procurement policies including climate risk and emissions mitigation have been drafted, but further improvements could be made to better integrate emissions reduction initiatives.
 - 33.5. The State Planning Policies will inform development of the policies contained in the future Planning and Design Code. State Planning Policy requires developers to "minimise the adverse effect of decisions made under the Act on climate change and promoting development that is resilient to climate change". This includes the implications of a reported lack of resourcing and need to upskill team members to accommodate and enforce policy changes.
 - 33.6. The Property Portfolio is exposed to shifts to building performance requirements as the development of a carbon price may lead to several important transition impacts related to operational and capital costs, as well as asset value.
 - 33.7. UPark Adelaide is an important Council revenue stream associated with the provision of carparks across the Council area for public use. With a potential societal transition towards increased public, active transport and electric vehicles these assets may become stranded assets.
 - 33.8. Waste collection and management is exposed to carbon pricing given the likely cost implications on the waste sector as higher levels of resource recovery can come at a higher (rates funded) cost.
 - 33.9. CoA's reputation, brand and desirability as an organisation are also at risk due to changing consumer preferences

Climate Risk Assessment Recommended Next Steps

34. The Assessment Report presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. While CoA has a strong track record in relation to responding to climate change there is still significant work required to address current and emerging risks.
35. A large number of proposed adaptation actions are presented for consideration by CoA to address the identified climate risks. A summary of the priority next steps is provided below:
 - 35.1. Prioritise climate change governance actions – focus on indicators for which there is currently no information or that received a low score i.e. public risk disclosure, emergency management and climate change policy.
 - 35.2. Public disclosure of risks – use the information in the Assessment Report to generate a public facing document that can be used to increase public awareness of CoA's current and emerging risks.
 - 35.3. Incorporate physical and transition risks into CoA's risk register – use the results of the Assessment Report to update CoA's corporate risk register and assist to prioritise adaptation options for implementation.
 - 35.4. Develop an adaptation roadmap – use the findings of the Assessment Report to inform an adaptation action plan that identifies the highest priority adaptation measures and how their implementation will be sequenced through time.
 - 35.5. Liability measures – legal liability risks were not able to be quantified in the Assessment. CoA should consider obtaining legal advice for medium to extreme liability risks, especially in relation to the potential impacts from potential future flooding.

Next Steps

36. It is proposed that the following next steps will be undertaken by the CoA to respond to the findings of the Assessment Report:
- 36.1. Develop a Climate Change Adaptation Action Plan to address identified governance (eg public disclosure), priority climate risks, associated adaptation measures (eg risk and action register) and timing of implementation.
 - 36.2. Establish a cross-program steering group to oversee the implementation of the Climate Change Adaptation Action Plan.

ATTACHMENTS

Attachment A - Climate Change Risk Assessment Report

- END OF REPORT -

Report for the City of Adelaide

29 June 2020



Prepared for:

The City of Adelaide

Prepared by:

Edge Environment and Climate Planning

Contact:

Mark Siebentritt - Director

Edge Environment

106 Gilles Street, Adelaide SA 5000

08 8232 4823 - mark.siebentritt@edgeenvironment.com

Citation for consolidated report:

Edge Environment and Climate Planning. 2020. Climate Change Risk and Adaptation Governance Assessment Report for the City of Adelaide. Prepared for the City of Adelaide, June 2020

Citation for Climate Change Adaptation Governance Assessment Report (Appendix A):

Climate Planning and Edge. Environment 2020. South Australia Climate Change Adaptation Governance Assessment: Climate Change Adaptation Governance Assessment Report for the City of Adelaide. Prepared for the City of Adelaide, June 2020.

Disclaimer

The information contained in this report is given in good faith and has been derived from sources believed to be reliable and accurate. Edge Environment accepts no legal liability for the accuracy of field data, analytical results or mapping data provided as part of this report or for any associated loss in productivity, business or such like through third part use of this data.

Edge Environment accepts no legal liability for failure of third parties to obtain any necessary government or other agency permits or approvals with respect to any issue raised in this report where approvals may be required. The material and opinions in this report may include the views or recommendations of third parties, which may not necessarily reflect the views of Edge Environment, or indicate Edge Environment's recommendation regarding a particular course of action. Edge Environment does not provide advice of an investment or commercial valuation nature. Edge Environment does not accept any liability for investment decisions made on the basis of environmental or other information provided in this report.

Revision	Revision Details	Author	Approved by	Date Approved
V1	DRAFT	Mark Siebentritt, Tim Watson, Donovan Burton, Chloe Portanger, Elizabeth Cuan	Mark Siebentritt	12 June 2020
V2	FINAL	Mark Siebentritt, Tim Watson, Donovan Burton, Chloe Portanger, Elizabeth Cuan	Mark Siebentritt	29 June 2020

Executive summary

Context

Climate change is impacting all aspects of life in Australia, from the way that our communities function through to the response of our economy and environment. The impact of a changing climate has already been demonstrated in Adelaide, illustrated through recent experience with bushfires and extreme heat in the 2019/20 summer, storms in 2016 and the Millennium Drought prior to that. While the potential impacts of climate change for Adelaide and its community are significant, the City of Adelaide already has a track record as a council leading the way on taking action on climate change at a national and international level. This is demonstrated by the Carbon Neutral Adelaide initiative and Council's commitment to 100 per cent renewable electricity for its operations. The Council also declared that climate change poses a serious risk to the people of Adelaide, and it should be treated as a national emergency. These actions are underpinned by a commitment by the City of Adelaide to be one of the world's first carbon neutral cities and an international leader in environmental change.

Despite recent progress, the focus of action on climate change has started to evolve significantly and this needs to be accounted for in future decision making by all councils. The emphasis has now expanded to recognise that from a legal and liability perspective climate change is a "material" risk which must be addressed by directors of private companies and public authorities. Informed by initiatives like the Taskforce on Climate Related Financial Disclosures Framework, the response to climate change is now being assessed by more broadly considering physical risk (the risks posed by a different future climate change), transition risk (the risks of transitioning to a low carbon economy) and climate change governance.

During the delivery of this project, which took place from October 2019 to June 2020, the COVID-19 outbreak occurred significantly impacting on the approach to delivery of this project. It also highlighted how potential risks at an international scale, if not identified and prepared for, can have a major impact on the operations of organisations from across the community and economy. Parallels have been drawn between COVID-19 and climate change in this regard.

Purpose of this assessment

The primary objective of this climate change risk assessment, which was delivered by Edge Environment and Climate Planning, was to review and assess climate change risks to the City of Adelaide's assets, operations and services.

The project differentiated between three key considerations in identifying and responding to climate change risk, those being:

- Climate change governance;
- Physical risk; and
- Transition risk

By combining multiple methodologies to assess climate risk, this report presents one of the most comprehensive assessments of climate risk and its underpinning governance currently undertaken for a South Australian council. The project relied primarily on phone call interviews rather than meetings and workshops due to the response to the COVID-19 outbreak.

Climate change governance assessment approach and findings

The City of Adelaide climate change adaptation governance assessment used Climate Planning's *Informed.City* climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance of Council. The tool provides a systematic way of assessing climate change governance and has been used for over 350 councils across Australia.

The governance assessment for the City of Adelaide was undertaken using a quantitative and qualitative assessment. These drew on the results from an online staff survey, results of an assessment of corporate governance documents, and findings from face-to-face meetings with representatives of Council. In total, over 250 staff were involved with the process and 13 corporate governance documents were reviewed. The assessment predominantly focused on adaptation governance.

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. A summary of quantitative climate change governance assessment scores is provided in Table 1. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly. With the completion of the physical and transition risk assessment through this project, the evidence base is available to effectively address climate change risk in the corporate risk management framework. The full governance report is provided at Appendix A.

Table 1. Quantitative climate change governance assessment scores.

Indicator	Level
Strategic Planning	Intermediate
Financial Management	High
Public Risk Disclosure	No data
Asset Management	Intermediate
Land Use Planning	Intermediate
Emergency Management	None
Greenhouse Gas Emissions Reduction	Advanced
Climate Risk Management	No data
Adaptation Planning	High
Climate Change Policy	None

Physical risk assessment

The approach to assessing physical risk was designed to align with ISO 13001, AS 5334—2013 (Climate change adaptation for settlements and infrastructure—A risk-based approach) and Council's Risk Management Operating Guidelines. Risks were identified in consultation with Council for key service, assets and infrastructure. Risks were assessed for two climate change scenarios; an intermediate emissions trajectory (RCP 4.5) by 2030 and a high emissions trajectory (RCP 8.5) by 2090.

Through the assessment, 283 individual physical risks to the City of Adelaide were identified. Over three quarters of the risks identified in the assessment were associated with:

- Temperature: including both average temperatures change as well as the increased frequency of very hot days and heatwaves; or
- Rainfall: including changing rainfall patterns, extreme rainfall and flooding events.

There were five extreme risks identified for the near future (2030) and 39 for the far future (2090), which is likely the result of increasing uncertainty and severity of climate change impacts toward the end of the century.

A projected increase in the frequency of very hot days was the highest source of risk overall (72 risks for 2030), and it also had the highest number of significant (high and extreme) risks for both the near and far-future assessments (38 and 53 risks respectively). This was followed by the effects of heatwaves (56 risks in total) and flood-related impacts (53 risks).

Across the City of Adelaide's operations, the asset or service area grouping with the highest number of individual risks was the Service group and Key sites. Infrastructure (including bridges, roads, drainage and footpaths) was also a significant source of risk.

Asset or service grouping	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Service group	15	48	53	1	4	28	65	20	117				
Key sites	30	40	32	0	17	36	42	7	104				
Infrastructure	12	21	22	4	8	10	29	12	60				
Buildings	3	1	0	0	2	2	0	0	4				
Parkland and open space assets	0	4	4	0	0	4	3	1	8				
Other	5	1	1	0	0	5	2	0	7				
Total	65	115	112	5	31	85	141	40					

In summary, the risks common across all categories were:

- Impacts of heat on people and the ability to deliver Council services, the desire for people to come to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.
- Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, streetscapes, Crown Land or the golf links.
- Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.

In addition to the risks to specific infrastructure elements, several other extreme risks were identified to the infrastructure management approach more broadly. These risks include:

- The lack of consideration of acute climate change effects in new asset design;
- The unknown actual and potential impacts of climate change across the existing asset portfolio and strategic businesses; and
- A lack of data collection across infrastructure assets to understand and proactively manage climate related impacts.

These risks all have potentially significant cost implications for the near and far future. Several adaptation actions were identified to address these risks, including:

- Foster innovative thinking to develop policies and position of Council to support the consideration of climate impacts in new asset design and explore opportunities to learn and share across council business units.
- Development of targets in long term financial plans related to climate change resilience that translates to actions in asset management plans.
- Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be built out to manage key risks.

It is common practice to ensure that extreme and high risks can have their residual risk rating reduced to moderate or lower once adaptation measures are implemented. Based on the adaptation measures identified in this risk assessment, this is possible for some but not all risks. Council needs to determine whether further identification of adaptation measures is required or whether it is willing to accept high risks in some instances.

One of the five consequence areas considered in the physical risk assessment was "liability" risk. It is important to note that the risks identified as a "liability" risk in the risk assessment are general in nature and have not been identified by a legal professional. Given the complex nature and broad range of potential legal risk associated with climate change it is difficult to assign likelihoods or possibilities as per a traditional risk management approach. Instead it is prudent that all risks and risk management options be assessed by in-house and/or independent legal professionals.

Transition risk assessment

Given uncertainties around future carbon emissions reductions, it is becoming increasingly important for organisations to prepare for a range of climate change futures to promote resilience, including addressing risks from the social and economic transition to low carbon economies. Potential risks resulting from the transition to a low carbon economy that have been identified through the Taskforce on Climate Related Financial Disclosures include changes in policy, regulation, technology, markets and business models, and reputation and confidence.

The first stage of the transition risk assessment was to identify and adopt internationally recognised scenarios and their characteristics to inform the future characteristics of a global low-carbon future. These were then adapted to ensure relevance for local scale application and used as the basis of a transition risk materiality assessment.

A total of 32 transition risks to the City of Adelaide were identified, covering specific Council assets, business units and risks to Council's operational goals and community. Importantly, Council's Carbon Neutral Adelaide initiative means that Council is already well positioned to respond to transition risk. Transition risks were identified for the following services, assets and infrastructure: aquatic centre and gas utilities, business model, fleet vehicles, carbon management and procurement, planning, property, UPark Adelaide and waste services.

In addition to risks, the following priority opportunities were also identified:

- Utilities and solar energy: A key opportunity in relation to energy is the development of shared solar and demand management initiatives.
- Property portfolio: A range of high priority opportunities for transition resilience across the City of Adelaide property portfolio were identified including the development and management of micro energy generation and storage networks on Council assets.
- Climate leadership: Given the City of Adelaide's progress and goals towards zero neutrality, there is an opportunity to export sustainability knowledge.

Aside from the risk and opportunities listed above, the effects of carbon pricing should be considered so as to build future resilience. This may have important implications across Council, from increasing the cost of waste services to changing tenant profiles at key sites. The City of Adelaide should build on current emissions reduction initiatives to focus on reducing exposure to these risks by:

- Understanding carbon hotspots across organisational operations; and
- Integrating carbon considerations into procurement processes to allow for more targeted and effective emissions reductions initiatives.

Next steps

The City of Adelaide has already demonstrated strong commitment to responding to the challenges posed by climate change. Future action to address current and emerging physical and transition risks and climate change governance issues should include the following:

- Prioritise climate change governance actions;
- Public disclosure of risks;
- Incorporate physical and transition risks into Council's risk register;
- Develop an adaptation roadmap; and
- Liability measures.

Contents

Executive summary	1
1 Introduction	1
1.1 Context	1
1.2 Objectives and approach	2
2 Governance assessment	3
2.1 Overview.....	3
2.2 Method.....	4
2.2.1 Quantitative Assessment	4
2.2.2 Qualitative Assessment	5
2.3 Results.....	6
2.3.1 Results for Staff Governance Survey	6
2.3.2 Results and Recommendations for Quantitative Assessment	8
2.3.3 Results and Recommendations for Qualitative Assessment	12
3 Physical risk assessment.....	16
3.1 Method.....	16
3.1.1 Risk assessment approach	16
3.1.2 Risk register development	17
3.2 Results.....	17
3.2.1 High level risk findings	17
3.2.2 Key sites risk summary	20
3.2.3 Buildings	30
3.2.4 Parkland and open space assets	30
3.2.5 Infrastructure	32
3.2.6 Other	40
3.2.7 Services.....	40
4 Transition risk and opportunity materiality assessment	58
4.1 Overview.....	58
4.2 Method.....	58
4.3 Results summary.....	59
4.3.1 Risks.....	59
4.3.2 Opportunities	62
5 Key findings.....	63
5.1 Climate change governance	63
5.2 Physical risk.....	63
5.3 Transition risk.....	65
5.4 Next steps	65
References	67

Appendix A – Governance Assessment Report.....	68
Appendix B – Council staff interviewed.....	69
Appendix C – Transition risk and opportunity workshop attendees.....	70

1 Introduction

1.1 Context

Climate change is impacting all aspects of life in Australia, from the way that our communities function through to the response of our economy and environment. Projections for climate change indicate that without a coordinated global response, conditions will become more challenging as greenhouse gases continue to increase in the atmosphere over the coming century. In South Australia this will result in a range of changes, including warmer and drier conditions on average, increased periods of extreme heat and drought, more intense rainfall and greater fire risk.

The impact of a changing climate has already been demonstrated in Adelaide. For example, in September 2016 major storms brought down power lines leading to a collapse in the operation of the energy distribution network, combined with damaging winds and flooding. This event effectively shut down Adelaide for a period of 24 hours. More recently, extreme heat across the city and damaging bushfires in the peri-urban areas during the 2019/2020 summer directly impacted health and well-being across the community and resulted in direct impacts on trade in the city.

While the potential impacts of climate change for Adelaide and its community are significant, the City of Adelaide already has a track record as a council leading the way on taking action on climate change at a national and international level. For example, Council:

- Declared that climate change poses a serious risk to the people of Adelaide, and it should be treated as a national emergency;
- Made significant progress with the Carbon Neutral Adelaide initiative;
- Participated in the development of the Resilient East Climate Change Adaptation Plan; and
- Committed to 100 per cent renewable electricity as part of a power purchase deal from 1 July 2020 for the City of Adelaide's operations.

Over the last 3-5 years, the focus of action on climate change has started to evolve significantly. In the past, much of the work centred on adaptation to a different future climate and mitigation actions to reduce greenhouse gas emissions. However, the emphasis has now also expanded to recognise that from a legal and liability perspective, climate change is a "material" risk which must be addressed by directors of private companies and public authorities. This has grown out of international and national legal opinion with the expectation that the responsibilities of directors of public authorities in responding to climate change is likely to be at least as significant as it is for directors of private companies.

The greater focus on the liability aspects of climate change risk has been accompanied by the rapid growth of the Taskforce on Climate Related Financial Disclosures Framework (TCFD), established by the Financial Stability Board in 2016. This initiative, which has a primary focus on large publicly listed, private sector businesses, is now having trickle down impacts on how the broader economy functions. This is reshaping how climate change risk is understood and responded to and recognises that climate change poses two key types of risk:

- Physical risk – The risks posed by a different future climate change; and
- Transition risk - The risks of transitioning to a low carbon economy.

In addition to differentiating between physical and transition risk, the TCFD also highlights the importance of governance in taking action on climate change, with a focus on how decision making within organisations accounts for climate change risk.

1.2 Objectives and approach

The City of Adelaide 2020-2024 Strategic Plan lists as an outcome the aim of being a “climate ready organisation and community” and a strategic priority to “Lead the way in climate action and manage water, waste, transport and greening in a sustainable way”. In addition to emission reduction and sustainability activities, the Council has exposure to climate-related risks.

The primary objective of this climate risk assessment, which was delivered by Edge Environment and Climate Planning, was to review and assess climate change risks to assets, operations and services, covering the following key aspects:

- Identification (and review) of climate risks against service and assets;
- Analysis of climate risks (existing and residual);
- Risk management for climate risks (including prioritisation of risks);
- Disclosure (and controls measures) of climate risks (including financial implications for high level risks).

The project differentiated between three key considerations in identifying and responding to climate change risk, those being:

- Climate change governance - Section 2;
- Physical risk – Section 3; and
- Transition risk – Section 4.

Climate change governance was assessed using the *Informed.City* tool developed by Climate Planning. The tool provides a systematic way of assessing climate change governance and has been used for over 350 councils across Australia. This report provides a summary of the governance assessment process and key findings. The full governance report is provided at Appendix A.

The approach to assessing physical risk was designed to align with ISO 13001, AS 5334—2013 (Climate change adaptation for settlements and infrastructure—A risk-based approach) and Council's Risk Management Operating Guidelines. This report provides a summary of the physical risk assessment process and key findings.

Transition risk was also assessed in a manner consistent with ISO 13001 and AS 5334—2013, as well as being aligned to the TCFD guidelines and identified material transitional risk areas associated with Council's operations, including:

- Market and technology shifts;
- Policy and legal; and
- Reputation.

The physical and transition risk assessment phases relied primarily on phone call interviews rather than meetings and workshops due to the response to the COVID-19 outbreak.

2 Governance assessment

The governance assessment undertook a systematic analysis to determine how climate change is factored into the City of Adelaide's decision making.

2.1 Overview

The governance assessment undertook a systematic analysis to determine how climate change is factored into the City of Adelaide's decision making.

The extent to which climate change risk and adaptation is considered in a local government's core governance documents may affect the implementation of the organisation's approach to climate change adaptation.

Measuring and monitoring indicators for climate change adaptation and mitigation governance provide a platform for a consistent approach. This allows local governments the ability to monitor and improve their performance over time. Initial focus and emphasis should be on a council's adaptation governance. Unless it can be ensured that a council's internal adaptive capacity is robust, that is its ability to respond to potential climate change impacts, then there is a risk that specific adaptation actions will be ad-hoc and constrained by limited resourcing and political support.

Understanding climate change governance may help decision-makers to estimate the vulnerability of a system to stress and address underlying causes of vulnerability over time. It may help to support proactive decision-making by assisting organisations to identify both the risks and possible responses in advance and develop the capacity to implement the required actions.

The need to focus on climate change governance is gaining momentum in academic literature, United Nations publications and approaches, as well as in corporate disclosure frameworks (Clos, 2015). For example, disclosure of governance arrangements around climate-related risks and opportunities is a key component of the recommendations of the Financial Stability Board's [Task Force on Climate-related Financial Disclosures](#) (TCFD) (see Figure 1).

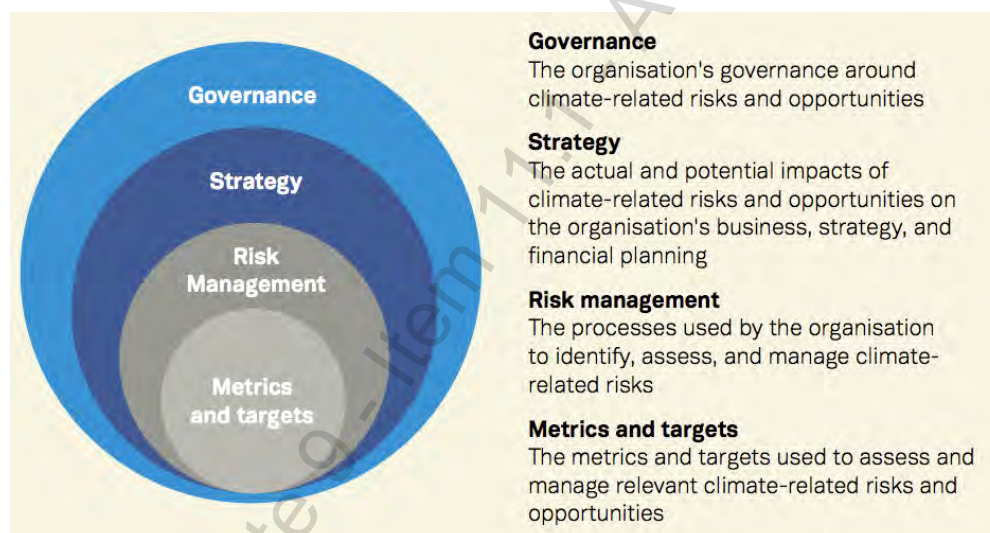


Figure 1. Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016).

This section of the report presents a brief overview of the methodology and results of an analysis about the extent of climate change adaptation governance for the City of Adelaide. It includes the information collected from an online staff survey, results of the governance assessment, and findings from face-to-face meetings with representatives of the City of Adelaide.

This assessment predominantly focuses on adaptation governance. Mitigation has been considered only regarding formal greenhouse gas emissions reduction targets. A detailed greenhouse gas emissions governance assessment requires an audit of baseline emissions data and data recording

protocols (e.g. emissions scope, alignment to Australian standards etc.) – which is outside the scope of this project.

The full climate change governance assessment report is provided at Appendix A.

2.2 Method

The City of Adelaide climate change adaptation governance assessment uses Climate Planning's *Informed.City* climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance of Council. The governance assessment for the City of Adelaide was undertaken in two stages: quantitative assessment and qualitative assessment.

2.2.1 Quantitative Assessment

The aim of the quantitative assessment was to identify publicly available corporate documents for the City of Adelaide and undertake a deeper exploration into how climate change is considered in those governance documents. These corporate documents are the key governance documents that either drive the organisational decision-making or report on the effectiveness of those processes. The documents were assessed against ten quantitative indicators for climate change adaptation governance as follows:

- Strategic Planning;
- Financial Management;
- Public Risk Disclosure;
- Asset Management;
- Land Use Planning;
- Emergency Management;
- Greenhouse Gas Emissions Reduction;
- Climate Risk Management;
- Adaptation Planning; and
- Climate Change Policy.

Justification for each indicator is provided in the full report at Appendix A.

The quantitative assessment focusses specifically on an assessment of Council's corporate documents which are publicly available which means they are accessible through an online platform (e.g. Council's website). An analysis of only public documents supports the growing recognition that disclosure of climate risk is an important element in climate change management. The Paris (Climate) Agreement recognises transparency as a fundamental principle in climate change management (both in actions and in governance). There is also an increasing call for local government disclosure of risk and governance responses by those who re-insure local government risk.

Keyword analysis

Publicly available corporate documents were identified from the City of Adelaide which align with the ten quantitative indicators of climate change adaptation governance (see Table 2). The team conducted a keyword analysis to identify how many words associated with climate change were present in Council's documents. Some of the words reviewed include 'climate change', 'adaptation' and 'greenhouse gas emissions' (a complete list of words can be found in the full governance assessment report at Appendix A). If any of these words were identified, closer analysis was undertaken of the context to assess the extent of how they were considered in the documents.

Table 2. The City of Adelaide's corporate documents identified for the quantitative assessment.

Indicator	Document Name
Strategic Planning (#1)	▪ Strategic Plan 2016-2020
Financial Management (#2)	▪ Integrated Business Plan 2019-2020
Public Risk Disclosure (#3)	
Asset Management (#4)	<ul style="list-style-type: none"> ▪ Building Asset Management Plan 2016 ▪ Infrastructure Asset Management Policy 2020 ▪ Park Lands Open Space Asset Management Plan 2016 ▪ Transportation Asset Management Plan 2017 ▪ Urban Elements Asset Management Plan 2016 ▪ Water Infrastructure Asset Management Plan 2016
Land Use Planning (#5)	<ul style="list-style-type: none"> ▪ Development Plan 2020 ▪ Adelaide Design Manual 2016
Emergency Management (#6)	▪ Eastern Adelaide Zone Emergency Management Plan 2018
Greenhouse Gas Emissions Reduction (#7)	▪ Carbon Neutral Strategy 2015-2025
Climate Risk Management (#8)	
Adaptation Planning (#9)	▪ Resilient East Regional Climate Change Adaptation Plan 2016
Climate Change Policy (#10)	

Evaluation Matrices

Corporate documents were assessed for each governance indicator using a scoring system developed by Climate Planning. The method is relatively simplistic as it uses scaled matrices with descriptions on a continuum between no consideration and an advanced consideration of climate change. Corporate documents were scored using a five-point scale which was tailored to each governance indicator in the quantitative assessment (these evaluation matrices are provided in Section 4.2).

Since the quantitative assessment relies on an analysis of the corporate documents, Council staff were not directly engaged for the quantitative indicators. Although, some findings obtained from the face-to-face meetings may inform and/ or provide context about some of the quantitative indicators and will therefore be presented in the results where relevant. However, they are not given any weight in the final conclusions of this report (other than limitations/ barriers to mainstreaming noted by the staff).

The findings in this report are based on a quantitative assessment of the City of Adelaide that was completed on the 24th of February 2020.

2.2.2 Qualitative Assessment

The purpose of the qualitative assessment was to build a more complete representation of climate change adaptation by focussing on the complex drivers which could not be understood through an assessment of public corporate documents in the quantitative assessment. These drivers are captured in seven qualitative governance indicators:

1. Climate Risk Assessments;
2. Climate Legal Risk;
3. Staff Capacity and Resource Allocation;
4. Community/ Stakeholder Engagement;
5. Institutional/ Intergovernmental Relationships;

6. Climate Change Information; and
7. Information Systems.

Justification for each indicator is provided in the full report at Appendix A.

Face-to-face meetings were undertaken with representatives from the City of Adelaide. During the meeting conversations, representatives were asked a series of questions which were then later used in a qualitative analysis to understand the issues, and barriers and enablers for considering climate change in decision making for the City of Adelaide. The information was obtained through a set of consistent questions aligned to the relevant themes.

The results collected through the qualitative assessment are not directly attributed a 'score'. The findings from this assessment are used to build a better understanding about some areas of this indicator that may not become evident through a reading of the documents in isolation. While are not attributed a score, the outcome will inform any discussion or recommendations. The face-to-face meetings for Council were conducted on the 19th and 20th February 2020.

2.3 Results

The results focus on key findings of the governance assessment as well as possible links drawn from a survey of staff members. This section first provides an overview of the results for the staff governance survey. It then addresses the results and specific recommendations for the quantitative and qualitative assessment separately. Any interesting findings from the face-to-face meetings or the staff governance survey which relate to a specific governance indicator have also been integrated into the results.

2.3.1 Results for Staff Governance Survey

Of the 254 staff members in the City of Adelaide who participated in the staff governance survey, the highest representation work in the Customer Service department (38 staff members, 15%). This is closely followed by the Water and Waste department which had 27 staff members (11%) participate in the online survey (see Figure 2). It is important to note that 254 respondents are considered a high response rate for an individual council's survey response.

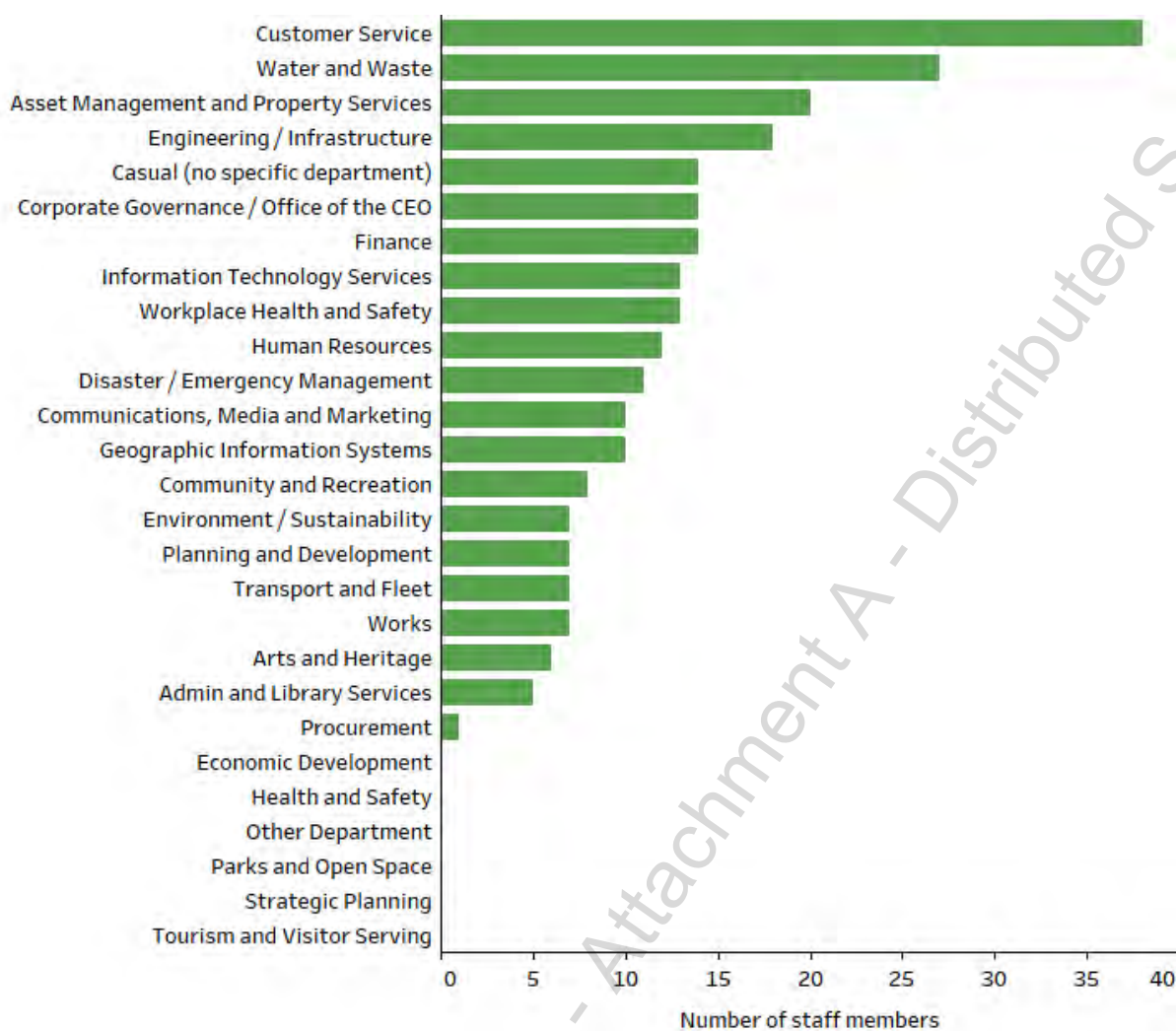


Figure 2: Number of the City of Adelaide staff members from each department who participated in the staff governance survey.

The online survey found that 86% of respondents have some level of understanding of climate change impacts and adaptation. There were 123 staff members who stated that their understanding is limited, and 93 staff members who believed that they could comfortably incorporate / consider climate change in their job (see Table 3). Furthermore, 144 respondents (64%) identified a good understanding of climate change as an enabler to Council's ability to plan for climate change.

Table 3. Understanding of climate change impacts and adaptation for the City of Adelaide staff members

	Number of staff members	% of staff members
I am not sure of my understanding	26	10%
I have no understanding	8	3%
My understanding is limited	123	49%
I could comfortably incorporate/ consider climate change adaptation	93	37%
Total	250	100%

2.3.2 Results and Recommendations for Quantitative Assessment

The specific results of the quantitative assessment have been divided into the ten quantitative indicators of climate change adaptation governance. This section will elaborate on the City of Adelaide's results for each governance indicator and provide specific recommendations for how council can transition to a higher score level. The analysis of each indicator will discuss the importance of the indicator, staff survey results, quantitative assessment results, and specific recommendations. Findings from the face-to face meetings will be provided for relevant indicators.

Only one recommendation has been provided for each indicator as a 'first step' for Council to transition to the next score level. These recommendations are specific to each level which means that completing one recommendation will only improve Council's score by one level. For this reason, there may be a range of recommendations which Council can implement to achieve a desired indicator score. For example, there are three specific recommendations which a council can implement to transition from 'Intermediate' to 'Advanced' for an indicator.

Overview of Quantitative Assessment Results

The governance assessment explored how climate change was considered in corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 3 displaying Council's performance.



Figure 3. The City of Adelaide's quantitative scores for climate change adaptation governance.

The evaluation matrix (see Table 4) provides a summary of the City of Adelaide's for each governance indicator including descriptions to explain how the indicators were assessed.

Table 4. The City of Adelaide's quantitative evaluation for climate change adaptation governance.

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. sea level rise) AND/OR one council function (e.g. land use planning) only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme. Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.

Quantitative assessment results

The rationale for the Quantitative assessment results are as follows:

Strategic Planning

The Strategic Plan 2016-2020 was reviewed for this indicator. The plan provides a diverse range of objectives to assist Council in becoming a carbon neutral city. The objectives focus on reducing greenhouse gas emissions in areas of energy and renewables, sustainability, biodiversity and procurement (The City of Adelaide, 2016). As a result, the City of Adelaide scored 'High' for the Strategic Planning indicator.

Financial Management

The Integrated Business Plan 2019-2020 was reviewed for this indicator. The plan considers climate change, specifically for the Climate Change Action Initiatives Fund. Through this fund Council seek to: *... invest in strategic incentive programs such as \$1.6 million for the climate change initiatives including the sustainability incentives scheme, sustainability performance improvement programs, low and zero emission vehicles, Carbon Neutral Adelaide Partners Program and Building Upgrade Finance.* (The City of Adelaide, 2019). Since the initiative aims to deliver a range of projects, programs and incentives, this sees the City of Adelaide score 'High' for the Financial Management indicator.

Public Risk Disclosure

The City of Adelaide's website was searched for a strategic risk register, however, no publicly available risk register was found. All corporate documents were reviewed from the other governance indicators however were unable to find any risk disclosure information. As a result, the City of Adelaide scored 'No data' for the Public Risk Disclosure indicator.

Asset Management

Six asset management documents were assessed for this indicator. All of Council's asset management plans consider climate change, with an emphasis on how these Asset Management Plans address Council's strategic planning actions to reduce carbon emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Asset Management indicator.

Land Use Planning

Two documents were assessed for this indicator, they were Council's Development Plan 2020 and the Adelaide Design Manual 2016. The review did not find keywords related to climate change in Development Plan. However, the Adelaide Design Manual specifically identifies the importance of street trees and plants in "preparing for the future challenges of climate change and creating a more climate resilient city" (City of Adelaide, 2016). The manual was included in this assessment as it provides strategic and technical guidance for the design and management of public spaces in the City of Adelaide. This sees the City of Adelaide score 'Intermediate' for the Land Use Planning indicator.

Emergency Management

Only the Eastern Adelaide Zone Emergency Management Plan 2018 was assessed for this indicator as a publicly available council emergency management plan was not found for the City of Adelaide. Since a consideration of climate change (or associated keywords) was not found in the plan, the City of Adelaide scored 'None' for the Emergency Management indicator.

Greenhouse Gas Emissions Reduction

A climate change target was searched for in Council's greenhouse gas emissions documents, other core governance documents identified in the quantitative assessment, and on Council's website. The assessment found a consideration to reduce greenhouse gas emissions in the Carbon Neutral Strategy 2015-2025 which establishes Council's aspiration to be a carbon neutral city. The strategy sets two emissions reduction targets. These targets are reflected in Council's Strategic Plan and Asset Management Plans. These results see the City of Adelaide score 'Advanced' for the Greenhouse Gas Emissions Reduction indicator.

Climate Risk Management

The City of Adelaide's website was searched for a risk management policy, strategy and/or plan. Since no publicly available risk management documents were found, the City of Adelaide scored 'No data' for the Climate Risk Management indicator.

Adaptation Planning

Only the Resilient East Regional Climate Change Adaptation Plan 2016 was assessed for this indicator as a publicly available council adaptation plan was not found for the City of Adelaide. This plan is Council's regional climate change adaptation plan which aims to provide a coordinated and collaborative response to climate change across the Eastern Region. The plan achieves these goals by identifying priority adaptation actions which will respond to the challenges and opportunities presented by a changing climate (Resilient East, 2016). This sees The City of Adelaide achieve a 'High' for the Adaptation Planning indicator.

Climate Change Policy

The City of Adelaide's website was searched for a climate change policy (which includes adaptation) and/or an environment/ sustainability policy, however, no relevant policies were found. This sees the City of Adelaide score 'None' for the Climate Change Policy indicator.

Using the scores identified above, a series of recommendations were identified that if taken, would assist council in increasing its score for each indicator (Table 5). This list of recommendations represents a summarised version of what is contained in the full governance assessment report at Appendix A.

Table 5. Summary of recommendations against quantitative indicators.

Indicator	Recommendations
Strategic Planning	To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc." Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaning information from other councils through peer-to-peer learning.
Financial Management	To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented.
Public Risk Disclosure	No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Asset Management	In order to achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. The asset management plan should also specify a prescribed response to one of the climate change issues. To upgrade to a 'High' level of response, Council will also need to undertake some spatial analysis of its assets that may be affected by climate change issues (e.g. increase flood risk, extreme heat).
Land Use Planning	To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the <i>Informed.City</i> TM governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan.
Emergency Management	To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known

Indicator	Recommendations
	disaster risks and affect those already especially vulnerable to natural hazards".
Greenhouse Gas Emissions Reduction	Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.
Climate Risk Management	No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Adaptation Planning	This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders.
Climate Change Policy	A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an <i>Informed.City</i> TM climate change adaptation governance assessment and have an advanced climate change policy.

2.3.3 Results and Recommendations for Qualitative Assessment

The results for the qualitative assessment focus on the seven indicators that are identified as key drivers for implementing climate change adaptation governance. The key results from the qualitative assessment are described below, with the full description of the importance of the indicator, staff survey results, qualitative assessment results, and specific recommendations contained in the report at Appendix A.

Climate Risk Assessment

At the time of the interviews, staff noted that some specific risk assessments had been undertaken but no overarching project that explored all of council's climate change risks. The assessment described in this report performs this role.

Staff discussed numerous climate change related risks during the meetings including the potential:

- impact of extreme heat on residents and retail trade, especially in parts of the city with limited shade;

- greater requirements for support for heat stress for visitors to the city or for the homeless;
- impact of extreme heat on major outdoor events;
- influence of hotter and drier conditions on greening across the city and specifically tree health;
- increased requirements for irrigation due to longer periods of hot and dry conditions, which will in turn influence operating costs;
- increased costs for operating facilities and buildings due to greater need for cooling;
- further changes to work hours to reduce the need for staff to be outdoors during hot weather;
- devaluation of assets due to reduced performance and operating life; and
- increase in liability claims from hazards such as flooding.

Climate legal risk

The assessment found that Council has not sought independent legal advice for any specific climate related risks and that the respective role of Council compared to residents and businesses in responding to climate risks is unclear. There was a strong interest in better understanding what Council's statutory requirements are in relation to risk management. Some of the staff noted that they had attended a climate legal risk presentation and that it was an issue that was still in the embryonic stages of understanding within the organisation.

The City of Adelaide has not been required to attend court or a tribunal for any climate change planning issues (e.g. related to development applications). Furthermore, Council's insurer (the Local Government Association Mutual Liability Scheme) has not requested any specific information about how Council is managing its climate change risk. Participants did not identify any instances where Council had refused developments based on climate change risks.

Staff Capacity and Resource Allocation

There was broad understanding of the importance of climate change as an issue presenting risks and opportunities for Council. This awareness was driven to a large degree by the Council's commitment to the Carbon Neutral Adelaide initiative and to a lesser extent the Resilient East Regional Climate Change Adaptation Plan.

Many participants indicated an understanding of climate change adaptation activities directly relevant to their functional areas, covering both services and assets. While many staff stated they had a general understanding of climate change there was a consensus that additional tailored training would be beneficial. The staff noted that Council was supportive of professional development activities. Some staff expected that they were likely to be exposed to training from peak bodies as the issue emerged further.

Community/ Stakeholder Engagement

Community awareness about climate change has become an important driver for action within Council. This is reflected in Council's commitment to Carbon Neutral Adelaide and the declaration of a Climate Emergency. The City has a strong community engagement focus, working proactively with residents, businesses and other organisations such as universities. Examples of past Council engagement that supports climate change action includes heat preparedness messaging before and during heatwave events, participation in the Hot Hot Hot event and community engagement about the value of city greening using tree tags.

It was noted that there is a focus on being a "climate-ready" community in the Strategic Plan and messaging with the community is centred on empowerment rather than a "fear-based" approach. Participants did not identify any instances where Council has worked with Indigenous traditional owners of the land regarding climate change issues.

Institutional/ Intergovernmental Relationships

There was a view among some participants that the relative roles and responsibilities of local government as compared with the State Government about responding to climate change was unclear at present. It was suggested that this issue requires clarification as part of the next phase of climate change planning within Council.

Climate Change Information

The City of Adelaide has used information about climate change from the IPCC, CSIRO, the Bureau of Meteorology, and various other scientific organisations, as presented and summarised in the Resilient East Regional Climate Change Adaptation Plan. This information is also being used as the basis of the current physical risk assessment. It was also noted that information such as the urban heat mapping has been used to build the business case for investment in greening, WSUD and inform discussion regarding materials selection.

At the face-to-face meetings some staff stated that they were likely to have climate change information readily available but were unsure about which information they should be using. It was noted by some staff that a climate change policy would help direct staff to robust information sources including what type of climate projections information should be used.

Council has not made a formal whole-of-council decision regarding the sharing of information with the community or business owners regarding areas or assets that may be at higher risk due to climate change hazards.

Information Systems

Council's website was analysed for climate change and its integration with other information systems. The website includes working connections to six social media platforms including Facebook, Twitter, Instagram, LinkedIn, YouTube, and WeChat. Also, the website has a dedicated page for climate change which explains the projected climate trends for the City and shows projects Council are working on to respond to climate change, including the Resilient East Regional Climate Change Adaptation Plan. The City of Adelaide has also established an online community hub called 'Your Say Adelaide'. This website is a consultation hub where the community can engage with Council and have their voices heard about issues in the region.

The City of Adelaide has a Facebook account which has 51,449 'likes' and 53,967 people following the page (as of February 2020). Council have also been a member of Twitter for 11 years (joined in February 2009) and in that time have gained 97,400 followers. These statistics show that Council has a high level of social media presence with considerable reach. There is a consideration of climate change in Council's posts which are focussed on awareness of climate-related hazards (i.e. heatwave) and Council's carbon emissions initiatives and targets and engagement for climate change community events. These results show that the City of Adelaide has actively communicated with the community about climate change issues. However, with such a large group of followers, there is an untapped potential for engagement which Council could utilise to improve community awareness on hazards and share information and build knowledge about climate change.

Table 6. Specific recommendations from the qualitative assessment.

Indicator	Recommendations
Climate Risk Assessments	<p>Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.</p> <p>Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.</p>
Climate Legal Risk	<p>Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.</p> <p>Ensure that legal risks associated with climate change are included in the risk register, until well managed.</p>
Staff Capacity and Resource Allocation	<p>Review opportunities to embed capacity building into existing staff training, such as new employee inductions.</p> <p>Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.</p>
Community/ Stakeholder Engagement	<p>Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.</p>
Institutional/ Intergovernmental Relationships	<p>Seek to clarify the role of Council as compared with the State Government about managing climate risk.</p> <p>Work with banks to better understand broader market risk and how they are considering the effects of climate change. It would be in the City's interest to identify how banks identify risk and what they see determines resilience at a City level. This may help City of Adelaide understand risk to rateable income due to property value risk. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.</p>
Climate Change Information	<p>Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.</p>
Information Systems	<p>Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.</p> <p>Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.</p> <p>Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.</p>

3 Physical risk assessment

The physical risk assessment considered the risk posed to the City of Adelaide's services, assets and infrastructure by a different future climate.

3.1 Method

The identification and evaluation of physical climate change risks and adaptation actions to the City of Adelaide was undertaken in accordance with AS5334-2013 *Climate change adaptation – a risk-based approach for settlements and infrastructure* and ISO31000:2018 *Risk management*.

3.1.1 Risk assessment approach

The approach is summarised in Figure 4, with the three key tasks highlighted as Tasks 1-3. These tasks were undertaken with key City of Adelaide stakeholders through one-on-one interviews. Interview participants are summarised in Appendix B.

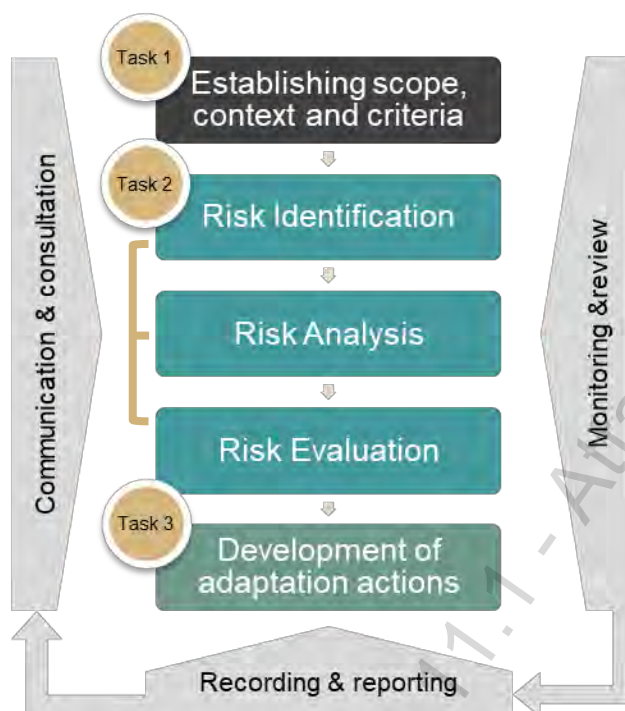


Figure 4. The climate risk assessment framework (adapted from ISO31000:2018).

Task 1: Establishing the context

The first stage of the risk assessment focussed on understanding the projected climate change impacts and their importance in the context of City of Adelaide to key asset stakeholders. The projected future climate context for 2030 and 2090 was summarised, using best available projections from the CSIRO Climate Change in Australia database and the Goyder Institute's Climate Change Projections for South Australia. These included future climate projections for temperature change, precipitation, drought, storms and other extreme climate events where relevant.

Task 2: Risk review, identification and evaluation

Aligning to the City of Adelaide risk management framework, this stage of the risk interview included:

- Review and updating of previously identified climate-related risks to specific City of Adelaide assets and service areas;

- Identification of any new or unforeseen direct and indirect climate-related risks associated with the City's operations or assets; and
- Evaluating climate related risks employing the City of Adelaide likelihood and consequence criteria to prioritise further management action.

Climate risks were identified and reviewed in the context of the projected changes to the regional climate for 2030 using the intermediate emissions scenario of RCP 4.5 and 2090 using the high emissions scenario RCP 8.5, considering any current controls or previously implemented mitigation actions.

Task 3: Development of adaptation actions

The third component of the risk assessment interview was the facilitated identification and/or development of adaptation options (i.e. risk mitigation actions) to manage the identified risks to an acceptable level. Adaptation options aimed to address all climate risk items identified as "medium", "high" and "extreme". Risks were then re-evaluated considering the adaptation actions.

3.1.2 Risk register development

After the risk assessment interviews, key findings were summarised in a climate change risk register aligning to the City of Adelaide risk assessment framework. Risk statements, control measures, risk ratings and adaptation actions were then reviewed by relevant Council staff to ensure accuracy.

3.2 Results

This section of the report summarises the key findings of the physical risk assessment. The full climate risk register has been provided in Excel format.

3.2.1 High level risk findings

Through the assessment, 283 individual risks to the City of Adelaide were identified. Over three quarters of the risks identified in this assessment were associated with the following climate variables:

- **Temperature:** including both average temperatures change as well as the increased frequency of very hot days and heatwaves; and
- **Rainfall:** including changing rainfall patterns, extreme rainfall and flooding events.

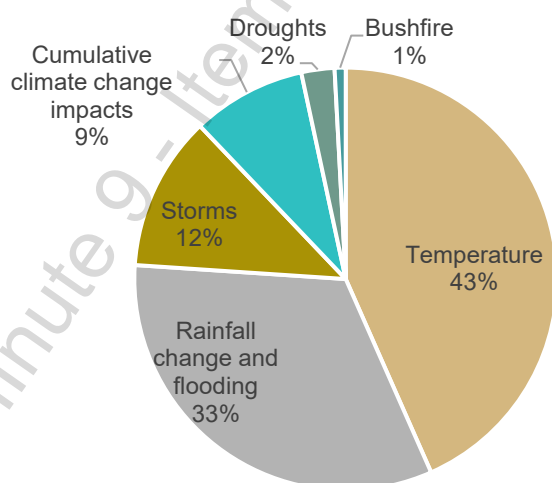


Figure 5. Proportion of climate risks by climate variable.

There were five extreme risks identified for the near future (2030) and 39 for the far future (2090), which is likely the result of increasing uncertainty and severity of climate change impacts into the far future. Importantly, many short term (2030) high risks may be relevant today and mitigation should be considered as a priority and addressed in an adaptation action plan. This effect is also visible with increased high risks in 2090 relative to 2030. The total number of risks and their ratings for each timescale are summarised in Figure 6 below. Residual risk ratings are also provided, demonstrating the potential implications of implementing the adaptation actions developed during the workshop process. With implementation of all proposed adaptation actions, it was assumed that:

- 90% of extreme risks (for 2090) could be addressed: and
- 49% of high risks could be addressed.

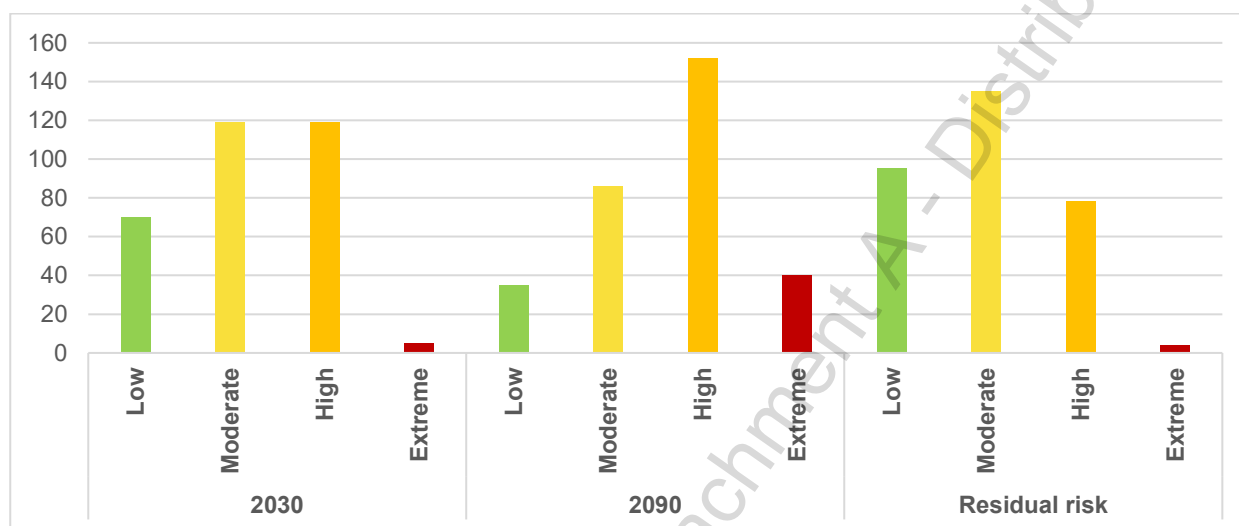


Figure 6. Total number of risks by time period and rating.

Extreme risks identified were associated with both cumulative climate change effects as well as acute climate change effects such as very hot days, heatwaves, flooding and hailstorms. A projected increase in the frequency of very hot days was the highest source of risk overall (77 risks for 2030), and it also had the highest number of significant (high and extreme) risks for both the near and far-future assessments (38 and 43 risks respectively). This was followed by the effects of heatwaves (59 risks in total) and flood-related impacts (57 risks). No risks associated with humidity changes were identified and reduced average annual and winter rainfall was the source of only two high risks. This follows an observed trend of a reduced number of priority risks being associated with chronic climate effects (such as gradual changes in temperatures and rainfall) compared to cumulative or acute impacts.

The number of risks, their ratings and timescales associated with the various climate change impacts are summarised in Table 7.

Table 7. Total number of risks by climate variable and rating across two timescales.

Climate Variable	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Increased average temperatures	4	10	4	0	2	6	10	0	18	77			
Increase in frequency of very hot days	17	22	38	0	6	18	43	10	77				
Increased duration of heatwaves	13	21	25	0	4	18	30	7	59				
Increased bushfire weather	0	3	0	0	0	1	2	0	3				
More frequent/severe droughts	0	6	3	0	0	3	6	0	9				
Changes to average humidity	0	0	0	0	0	0	0	0	0				
Reduced average annual rainfall	0	1	0	0	0	0	1	0	1				
Reduced average winter rainfall	0	1	0	0	0	0	1	0	1				
Increased intensity of hailstorms	2	4	1	0	2	0	4	1	7				
Increased extreme rainfall intensity and flooding	16	21	19	1	11	18	20	8	57				
Increased intensity of storm events and lightning	2	11	9	0	1	10	5	6	22				
Cumulative climate change impacts	6	11	12	4	1	10	14	8	33				
Increased intensity of extreme winds	5	4	4	0	4	1	8	0	13				

High level asset or service grouping findings included:

- Across City of Adelaide's operations, the asset or service area grouping with the highest number of individual risks was the Service Group (including services such as waste collection, cleaning, customer service, events and maintenance), with 117 individual risks, with one of these being extreme and 53 being evaluated as high for the near future
- Key Sites (which includes large assets such as Rundle Mall, Central Adelaide Market and the Aquatic Centre) with 104 risks in total, 32 of which were rated as high for the near future.
- Infrastructure (including bridges, roads, drainage and footpaths) was also a significant source of risk, with 60 risks in total. Four extreme and 22 high risks were identified that were associated with infrastructure.

Table 8 summarises the number of risks and their rating for each of the asset or service groupings.

Table 8. Total number of risks by asset or service grouping and risk rating across two timescales.

Asset or service grouping	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Service group	15	48	53	1	4	28	65	20	117				
Key sites	30	40	32	0	17	36	42	7	104				
Infrastructure	12	21	22	4	8	10	29	12	60				
Buildings	3	1	0	0	2	2	0	0	4				
Parkland and open space assets	0	4	4	0	0	4	3	1	8				
Other	5	1	1	0	0	5	2	0	7				
Total	65	115	112	5	31	85	141	40					

The following sections explore the climate related risks identified for each asset or service grouping in detail, focussing on high and extreme risks.

3.2.2 Key sites risk summary

This grouping covers City of Adelaide's important built assets, each of which provide the community with important social and economic infrastructure. These assets include the bus station, Adelaide Town Hall, Rundle Mall and several other iconic locations. As mentioned, the key sites group was associated with the highest total number of climate risks in this assessment, likely owing to the broad financial, economic and social role played by these assets in the community as well as increased interviewee representation.

No extreme risks were identified for the near future for these sites, however, nine were identified for the far future. Across all key sites, Adelaide Town Hall and UParks were identified as having the highest number of risks in total (16 and 17 risks each, respectively), followed by Rundle Mall, the Central Market and golf links. The number of risks and their ratings for the key sites group is summarised in the table below.

Table 9. Total number of risks for City of Adelaide's key sites.

Key sites	Risk ratings				2030				2090				Total
	L	M	H	E	L	M	H	E	L	M	H	E	
Aquatic Centre	1	3	3	0	1	1	3	2	7				7
Bus Station	5	0	0	0	5	0	0	0	5				5
Community Centres	3	4	3	0	2	1	5	2	10				10
Golf Links	0	7	5	0	0	7	5	0	12				12
Town Hall	6	5	5	0	6	5	5	0	16				16
Uparks	3	9	5	0	2	10	5	0	17				17
Depot and Workshops	1	2	5	0	0	2	6	0	8				8
Rundle Mall	5	5	3	0	0	5	7	1	13				13
Adelaide Central Market	6	5	2	0	1	5	5	2	13				13
Colonel Light Centre	0	0	1	0	0	0	1	0	1				1
Total	30	40	32	0	17	36	42	7					

Aquatic Centre

Seven risks were identified at the Aquatic Centre, the most significant of which were related to the impacts of heatwaves and very hot days. Key risks included the health-related impacts of increased future temperatures on staff and patrons. This was of particular concern for the far future, where projections suggest more significant change and higher uncertainty.

Current controls to manage these risks for staff included provision of water, as well as demister fans and increased scheduled breaks during heatwave periods. Risks to the public were associated with increased future asset patronage and the increased need for visitors to wait in exposed areas to enter the facility. Proposed adaptation actions for this risk included the upgrade of facilities to reflect heat from external building surfaces as well as improving the asset's insulation, as well as to create more shade structures or to set up temporary shading on extreme heat days. These actions were deemed to reduce extreme risks to high and moderate ratings.

Flood related impacts were also identified as a high risk to the asset, related to the potential flooding of the site during extreme rainfall events and resultant need for facility closure and repair. This risk is currently managed given the recent upgrade of the drainage system, which should be investigated for capacity given the implications of climate change on rainfall intensity.

A summary of the key risks to the Aquatic Centre is provided in Table 10.

Table 10. Summary of high and extreme risks to the Aquatic Centre.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Staff exposed to artificially high temperatures in the centre for long periods of time	Staff health and safety compromised from being exposed to extreme heat conditions	Staff are provided with water. Demister fans Staff are given more breaks during these times	H	E	Upgrade facility to reflect heat from the external roof and walls Investment in building insulation.	H
Increase in frequency of very hot days	Increased community use of facility, people line up to enter the centre in the open.	Community exposed to heat whilst waiting to enter the facility	Staff monitor members of the public	H	E	Create shade structure outside or plant trees to shade customers. Set-up temporary fans or misting systems.	M
Increased extreme rainfall intensity and resultant flooding	Flooding as a result of extreme rainfall	Facility closure for repair and maintenance	Drainage system has been upgraded	H	H	Further drainage system upgrades	M

Bus Station

Physical climate related risks to the bus station related to flooding impacts on timetabling, heat related impacts on public health as well as increased maintenance and repair costs. All risks were considered low priority in this assessment.

Community Centres

Community centres were associated with a range of climate risks (nine in total), with all significant risks related to two linked hazards; increased temperatures leading to reduced thermal comfort in the community and the resultant increase in patronage of the centres, which would lead to resultant increased costs for cooling the assets. Extreme risks related to these hazards were identified under heatwave conditions, which highlights the increased likelihood of this occurring under scenarios with multiple hot days in a row. Current controls for these risks include ensuring that HVAC systems are operational and that energy efficiency measure are in place.

Addressing these risks through adaptation actions for the far future was associated with expanding current HVAC system capacity, extending operating hours to accommodate the increased demand from patrons, installing energy efficiency measures and potentially incorporating passive cooling design principles to reduce operational costs.

Priority risks to community centres are summarised in Table 11.

Table 11. Priority risks to community centres.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased number of people wanting to use the visitor centres as cool refuges	Increased energy costs for cooling	Energy efficiency measures	H	H	Energy efficiency measures Passive design measures in new builds	M
Increase in frequency of very hot days				M	H		M
Increased duration of heatwaves				H	E		H
Increased average temperatures	Increased temperatures reduce thermal comfort for general community	Increased number of people wanting to use community centres as heat refuges	Ensure that HVAC systems are operational	M	H	Provide additional cooling	M
Increase in frequency of very hot days				M	H	Use building design principles that optimise passive cooling Increased online services Extended operating hours	M
Increased duration of heatwaves				H	E	Backup storage in case of power failure	H

Golf Links

A total of 11 risks were identified at the Golf Links, all rated moderate to high. The high risks to this asset relate to a range of climate effects. Priority risks related to the increased frequency of very hot days were associated with reduced productivity, service delivery and employee health and safety. It was noted that on very hot days, staff cannot work on the green, leading to a build-up in the pipeline of scheduled works. A current control to manage this risk is to change schedules to focus on indoor tasks. It was suggested that to mitigate this risk in future, an increased automation of much of the green works would reduce the need for field staff to be working in exposed areas, thus reducing the risk to a low rating. It was also noted that the kitchen in one of the golf links assets significantly overheats on very hot days due to inadequate HVAC capacity. This risk has work, health and safety (WHS) implications and could be addressed through upgrading HVAC systems.

The increased intensity of storms was also noted as a key climate impact given the leaks in multiple buildings across Golf Links. Under climate change, these impacts would be exacerbated leading to increased maintenance and repair costs. It was proposed that upgrades to these assets could significantly reduce this risk into the future.

As temperatures rise, more water is required by the Golf Links infrastructure to ensure service delivery. This will lead to increased future water consumption and a greater environmental burden of

the asset. It was noted that alternate water sources are available and management strategies are in place to increase water use efficiency. Further water use reduction and efficiency measures were noted as potentially effective controls for this long-term, chronic risk.

Another priority risk to Golf Links is the impacts of droughts on the Torrens River (current Golf Links water supply) and the need to use alternate water sources which are of lower quality. The impacts of this shift are on the maintenance and repair costs, which increase due to the effects of high salinity and nutrient loads in alternate water source. Measures to address this risk in future include water capture and reuse expansion to address water use issues and demand management activities (irrigation) to reduce consumption and increase productivity.

Priority risks to the Golf Links are summarised in Table 12.

Table 12. Priority climate risks to Golf Links.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Hot days reducing ability for staff to work on green, causing delays in works and jamming up pipeline of works	Reduced productivity and service delivery	Changing schedules to focus on indoor activities	H	H	Increased automation of works to reduce need for ground staff in field	L
	Very hot days leading to overheating of kitchen space (low HVAC capacity)	Health and safety impacts for staff	WHS policies	H	H	Upgrade HVAC systems	L
Increased intensity of storm events and lightning	Buildings across golf links leaking during storm events	Increased maintenance and repair costs	Maintenance and repairs	H	H	Upgrade building assets to address leak issues	L
Increased average temperatures	Increased water use	Greater environmental burden	Alternate sources of water available. Management strategies are also in place to reduce water use	H	H	Water efficiency initiatives	M
More frequent & severe droughts	Prolonged drought reducing flows in Torrens and forcing change to lower quality (salinity and nutrient loads from the Gap) water source	Impacts on green quality, increasing maintenance costs	Changing water sources is simple however the reduced quality has impacts on the green fairway changes have been made to accommodate the reduced quality of the alternate water source.	H	H	Water capture and reuse expansion to address water use issues. Demand management activities (irrigation as opposed to manual watering) to reduce consumption and increase productivity.	H

Town Hall

Seventeen risks were identified for the Town Hall, with half of these related to temperature change effects including hot days and heatwaves. Floods were also identified as a key source of climate risk to this asset.

Hazards associated with very hot days included the inability to maintain thermal comfort for Town Hall patrons as well as the resultant increased wear and tear on HVAC systems. A recently installed chiller, as well as operational plans are in place to manage these risks, however, they are still considered high risks for both the near and far future. A proposed adaptation for these risks is to upgrade older chillers to improve HVAC capacity and efficiency.

Heatwaves were also a significant source of risk, both in terms of increased wear and tear (as above) and due to the increased likelihood of heatwave-related blackouts and their resultant impacts on Town Hall's operations. There are generators onsite to manage blackout situations however this was still considered an important risk given the projected impacts of climate change.

Bushfires were also cited as a high priority indirect risk to the Town Hall due to smoke ingress into the building envelope via the HVAC systems. This has been identified as an important risk across all buildings. No current control for this risk is in place.

The table below provides a summary of the priority risks to the Town Hall.

Table 13. Priority climate risks to the Adelaide Town Hall.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Inability to maintain thermal comfort evenly across Town Hall floors	health and safety impacts	One new chiller in place to manage hotter days. Cooling starts early during hot periods to manage heat impacts	H	H	Upgrade older chillers to improve HVAC efficiency and efficacy	M
	Increased wear and tear to HVAC systems	Increased maintenance costs	HVAC contractor maintains systems regularly	H	H	Accept risk	H
Increased duration of heatwaves	Increased energy demand from property for HVAC operation	Increasing operational costs	Energy efficiency measures	H	H	Energy efficiency measures	H
	Heatwave-related blackouts	Loss of critical infrastructure and resultant site closure	Two generators at Town Hall to cover critical infrastructure such as computer servers and other emergency assets. Emergency Management Plan in place to deal with blackout situations	H	H	Additional generators	H
Increased bushfire weather	Bushfire smoke ingress into assets	Service delivery impacts	No current management plan for this risk	M	H	Accept risk	H

UParks

UParks are an important source of revenue for the City of Adelaide and have a number of vulnerabilities to the impacts of climate change. Seventeen risks in total were identified and all significant risks were related to temperature-based impacts on site operations, costs and staff health and safety.

Three high risks were linked to the reduced ability of staff to service parking ticket boxes on very hot days, with consequences including reduced productivity, health and safety risks as well as reputational impacts associated with hot days leading to event cancellations. There are a range of current controls to address these risks, however it was still considered high for both the near and far future. Increased automation of parking facilities was identified as a potential approach to reduce the risk level across all consequence areas.

Hot days and heatwaves were also identified as being a source of risk to electrical components (the ticket machine in Central in particular) and chilled communications racks in parking buildings. The consequence of these risks included increased maintenance and repair costs. While the risk to chilled communications racks was accepted, it was identified that there is a need to upgrade the machine in Central to reduce overheating impacts.

Table 14 provides a summary of the priority risks to UParks.

Table 14. Priority climate risks to UParks.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Reduced ability for staff to service parking ticket boxes under very hot conditions	Reduced productivity and service delivery	In-car air con protects staff in transit and ice cold water is made available to all staff. Staff are then in mainly in undercover environments except parkland staff, where staff are swapped frequently on very hot days. Generators are used in some locations where power is not available to cool ticket boxes.	H	H	Increased automation to reduce need for attendance	M
		Health and safety risks to staff		H	H		M
		Increase event cancellation leading to revenue impacts		H	H		M
	Parking machine in Central overheating	Increased costs for maintenance	Maintenance and repair	H	H	Upgrade machine to reduce overheating impacts	M
Increased duration of heatwaves	Overheating of electrical components and chilled communication s racks in parking buildings	Increased maintenance and repair costs	Repair and maintenance	H	H	Accept risk	H

Depot and Workshops

Eight climate related risks were identified for the Depot and Workshops, mainly related to the physical implications of climate change effects on the asset leading to increase maintenance costs as well as productivity and health and safety impacts on employees.

Very hot days were identified as a priority risk given the potential for significantly increased internal temperatures leading to reduced staff productivity. Several current controls exist for this risk, however this is still considered a high risk for the near and far future. Heatwaves were also identified as a key source of risk due to the increased temperature of building materials leading to degradation and increased asset maintenance costs. Adaptation actions to address these risks include retrofitting shading structures to reduce build-up of heat in asset elements on very hot days.

Extreme winds and hailstorms were identified as key risk areas, related to direct damage to assets and resultant maintenance and repair costs. These high risks were considered manageable in future through ensuring buildings are well maintained and that inspections are increased before and after major wind events.

The capacity of the drainage system to cope with increasingly extreme rainfall events as well as the potential for hail to block drainage systems was also identified as a key risk area. Resultant flood related impacts were identified as significant in both the near and far future that could be treated through the incorporate of onsite retention and detention systems. Hail was also identified as a potential source of increased repair costs through direct damage to the workshop and depot assets.

Table 15 provides a summary of the priority risks to depot and workshop assets.

Table 15. Priority climate risks to depot and workshop.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperature of workshop and depot workspaces	Reduction in staff productivity	Buildings are insulated, staff can alter work hours to work in cooler parts of the day. Air conditioning installed in indoor spaces	H	H	Shading of workshop and depot through use of living and non-living shade structures Use of reflective roof surfaces and reflective pavement surfaces to reduce build up of heat	M
Increased duration of heatwaves	Increased temperature of workshop and depot workspaces	Accumulation of heat in building materials results in increased maintenance costs	Buildings are maintained as required	H	H	Invest in further insulation	L
Increased intensity of extreme winds	Increased force on building surfaces	Possible lifting of roofs, battering of cladding by winds	Buildings are maintained as required Loose items are locked down Buildings constructed to meet wind load requirements	H	H	Ensure buildings are well maintained Increase inspections before and after major wind events Accept risk of winds	H
Increased extreme rainfall intensity and	Greater amounts of water entering the stormwater and drainage	Overwhelmed stormwater system results in flooding	Stormwater system is designed for 1	H	H	Invest in onsite stormwater detention and retention	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
resultant flooding	systems during peak times of storms		in 100 year flood events			systems for overflow scenarios	
Increased intensity of hail storms	Hail blocks stormwater and roof drainage systems	Overwhelmed stormwater system results in flooding		H	H		M
	Increase in the amount of hail, size of hail stones	Damage caused to buildings as a result of impact	Buildings maintained as required	M	H		L

Rundle Mall

Thirteen risks were identified for Rundle Mall, with eight of these being considered significant in the long term. One extreme risk was identified for this asset (for the far future), related to the impacts of heatwaves on Rundle Mall patrons, leading to reduced sales for tenants. Provision of shade and water fountains was not considered adequate to manage this risk in the long term, therefore additional adaptation actions such as a shift trading hours to accommodate heat impacts, provision of continuous shade in the mall, changing the ground surface to cooler materials and increasing other cooling options were all identified to reduce the impacts of this risk.

Table 16 provides a summary of the priority risks to Rundle Mall.

Table 16. Priority climate change risks to Rundle Mall.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Reduce patronage of the mall over summer months	Reduced sales	Increased provision of HVAC, misters and cooling fans Drinking fountains Access to shade shelters	M	H	Shift trading hours Provide continuous shade in the mall Change ground surface to cooler materials	M
Increased bushfire weather	Greater smoke persisting in the city	Reduced sales	Health warnings regarding air quality	M	H	Accept the risk. No options available to clear smoke	H
Increased duration of heatwaves (very high confidence)	Increased risk of people experiencing heat stress or heat stroke in exposed areas of the mall	Increased emergency services call outs for shoppers and staff	Increased provision of HVAC Drinking fountains	H	H	Shift trading hours Provide continuous shade in the mall	M
		Reduced sales	Access to shade shelters	H	E	Change ground surface to	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		Liability risk caused by shoppers claiming that Council not providing safe facilities		M	H	cooler materials Increased cooling options	M
		Rundle Mall becomes less attractive as a shopping precinct compared with covered suburban shopping malls		M	H		M
	Heatwave-related blackouts	Reduced ability for shops to operate security and payment systems	Back up power for key buildings	H	H	Increased use of backup power systems	M
Increased extreme rainfall intensity and resultant flooding	Drainage systems overwhelmed	Increased flooding causing slip hazards for shoppers and staff	Provide signage to alert shoppers of risk areas Access to shelters from the rain	L	H	Increase capacity of drainage systems Invest in WSUD measures	M

Adelaide Central Market

There was a total of 11 climate related risks identified for Adelaide Central Market. Seven of these were identified as priority risks that should be addressed through adaptation actions.

All significant risks were associated with temperature change, with heat-related discomfort leading to reduced retail sales and associated reputational impacts due to tenant dissatisfaction. Also identified was the projected increase in energy consumption and associated costs due to increased requirements to cool the asset to achieve appropriate thermal comfort. These risks were rated high to extreme in the long term, and could be mitigated through adaptation actions such as increasing cooling and HVAC capacity, broadening night time shopping opportunities and implementing energy efficiency measures.

Table 17 provides a summary of the priority risks for the Adelaide Central Market.

Table 17. Priority climate change risks to Adelaide Central Market.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperatures reduce thermal comfort for shoppers and create risk of heat stress	Retail sales decline and food safety concerns	Onsite cooling systems Existing evening shopping hours	M	H	Increased cooling Additional night time shopping options	M
	Reduced ability of HVAC systems to maintain internal comfort	Reputational impacts due to dissatisfied tenants	Onsite cooling systems Existing evening shopping hours	H	E	Increased cooling Additional night time shopping options	M
	Increased energy demand from property	Increased energy costs	Managed through Council's power purchase agreement Installed solar PV helps to reduce power costs	M	H	Energy efficiency measures	L
Increased duration of heatwaves (very high confidence)	Increased temperatures reduce thermal comfort for shoppers and create risk of heat stress	Retail sales decline	Evening shopping hours Onsite cooling systems	M	H	Increased cooling Additional night time shopping options	M
	Reduced ability of HVAC systems to maintain internal comfort	Reputational impacts due to dissatisfied tenants	Evening shopping hours Onsite cooling systems	H	E	Increased cooling Additional night time shopping options	M
	Increased energy demand from property	Increased energy costs	Managed through Council's power purchase agreement Installed solar PV helps to reduce power costs	M	H	Energy efficiency measures	M
	Increased energy demand from property	Reduced ability to meet site energy reduction targets	Managed through Council's power purchase agreement for renewables	M	H	Energy efficiency measures	M

Colonel Light Centre

The Colonel Light Centre was identified as a high-risk asset to the effects of climate change related to the projected increased frequency of very hot days. It was noted that there is a current inability to maintain thermal comfort across the Centre, which will likely be exacerbated by future temperature increases. Addressing this risk is a short-term priority and could involve upgrading aging chillers in the centre and implementing measures to improve HVAC efficiency. The details of this risk are provided in Table 18.

Table 18. Priority risk to Colonel Light Centre

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Inability to maintain thermal comfort evenly across Colonel Light Centre	Reduced productivity	HVAC systems	H	H	Upgrade older chillers to improve HVAC efficiency and efficacy	M

3.2.3 Buildings

Three risks to buildings were identified however none of these were evaluated as priority risks in this assessment. Risks to specific assets across the City of Adelaide is covered in the Key sites section (See section 3.2.2 above).

3.2.4 Parkland and open space assets

The City of Adelaide maintains a wide range of parks and open space assets, which include green assets, streetscapes and trees. Several priority risks to these assets were identified, including the increased mortality of tree plantings on very hot days and resultant urban heat island implications, which was evaluated as an extreme risk for the far future. Other risks were associated with water-shortage based vegetation loss and the exposure of ground staff to extreme heat conditions. Although a range of current controls were documented, these were deemed inadequate to manage these risks in the short term.

Adaptation actions proposed included broadening the greening program to include more in-ground plantings that are supplied by urban runoff, increasing street tree irrigation to ensure plant survival on hot days and implementing temperature-related work thresholds to reduce heat-related exposure to Council staff. More details on the priority risks to parklands and open space assets are provided in the table below.

Table 19. Priority climate risks to parkland and open space assets

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Water shortage for greening in large proportion of parklands	Vegetation loss, increased heat, decreased human health and well-being	Research to demonstrate needs, and links to recycled water and implementation of WSUD	H	H	Need more rainfall permeability especially in CBD (e.g. permeable asphalt, paving, better rainwater harvesting).	H
Increase in frequency of very hot days	Plants become water stressed and heat burnt	Increased mortality of plantings (especially in unirrigated)	Replacement plantings and increased irrigation	H	E	Consider additional irrigation for irrigated parklands (e.g. incorporate WSUD and permeable paving) and	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		areas) and compromised tree condition leading to increased UHI effects especially in unirrigated areas				species selection for biodiversity plantings	
	Staff are exposed to extreme heat	Work schedules and activities are compromised	Start earlier in heat wave times - plan harder work for earlier in the day, do less strenuous work and choose more shaded locations where possible	H	H	Increased trees and irrigated green spaces will help to cool the city generally and provide more suitable working conditions	M
				H	H	Implement temperature threshold triggers above which staff works are permitted in shade/air conditioned locations only	H

Climate risks to crown land were all related to the impacts of droughts and very hot days on vegetation. This risk has cost, amenity and urban heat island implications for the City of Adelaide. Current controls are focussed on alternate water supplies in the Glenelg Adelaide Pipeline and irrigation, however, these risks were each considered high priority in the short term. Future adaptation actions proposed included investigation of broadening supply through rainwater capture and storage as well as conversion to artificial turf to reduce water consumption requirements and exposure to drought related impacts. More detail on priority risks to crown land is provided in Table 19.

Table 20. Priority climate risks to crown land.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
More frequent & severe droughts	Die off of green vegetation	Costly to maintain, limits use by people, decreased amenity, increased contribution to urban heat island	GAP (Glenelg Adelaide pipeline) works for the most part but is costly to maintain and does not cover the whole parklands	H	H	Investigate ways to capture and store rainfall on site Implement Water Sensitive City Plan	H
Increase in frequency of very hot days		Costly to maintain, limits use by people, decreased amenity, increased contribution to urban heat island	Irrigation of green spaces	H	H	Considering artificial turf but costly and has implications of urban heat and biodiversity and soil quality	H
			GAP (Glenelg Adelaide pipeline) works for the most part but is costly to maintain and does not cover the whole parklands	H	H		H

3.2.5 Infrastructure

The City of Adelaide's infrastructure portfolio covers crucial urban elements such as roads, bridges, footpaths, kerbs and drainage. Given the often long-term design life of many of these assets, they can be particularly vulnerable to climate change impacts. Risks related to these elements are also frequently prioritised given their importance in modern society and very public nature. One extreme risk was identified to specific elements of the infrastructure asset portfolio for the short term, related to the stormwater and drainage network (see Table 21 below). This category was associated with eight extreme risks in the far future. Importantly, the IPWEA Asset Management and Financial Guidelines Practice Note 12.1 2018 is being employed by the infrastructure team to identify key risk areas and inform adaptation planning. This guidance document provides approaches for assessing and managing the impacts of climate change on the useful life of infrastructure.

Table 21. Total number of climate risks and ratings across City of Adelaide infrastructure assets.

Infrastructure elements	2030				2090				Total
	L	M	H	E	L	M	H	E	
Roads	0	0	7	0	0	0	7	0	7
Bridges	1	2	2	0	1	1	3	0	5
Footpaths	0	4	4	0	0	4	4	0	8
Kerb & Water Table	0	2	0	0	0	0	2	0	2
Stormwater Drainage Network	2	1	8	1	2	1	1	8	12
Traffic signals	0	5	0	0	0	0	5	0	5
Lighting and Electrical	5	0	0	0	5	0	0	0	5
Urban elements	4	7	1	0	0	4	7	1	12
Total	12	21	22	1	8	10	29	9	56

In addition to the risks to specific infrastructure elements, several other extreme risks were identified to the infrastructure management approach more broadly. These are summarised in the table below. These risks are all related to the cumulative effects of climate change over time and include:

- The lack of consideration of acute climate change effects in new asset design;
- The unknown actual and potential impacts of climate change across the existing asset portfolio; and
- A lack of data collection across infrastructure assets to understand and proactively manage climate related impacts.

These risks all have potentially significant cost implications for the near and far future – and the current reactive management approach was not deemed sufficient to ensure infrastructure asset portfolio resilience under the cumulative impacts of climate change. Several adaptation actions were identified to address these risks, including:

- Foster innovative thinking of team to develop policies and position of Council to support the consideration of climate impacts in new asset design and explore opportunities to learn and share across council business units.
- Development of targets into long term financial plans related to climate change resilience that translates to actions in asset management plans.
- Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be built out to manage key risks (e.g. catchment mapping to identify potential flood zones under climate change).

Table 22. High priority risks identified related to the broad infrastructure portfolio management approach.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Lack of consideration of climate change impacts in design and replacement across all infrastructure types (like for like replacement approach) - especially for large assets	Reduced service life and increased future replacement and maintenance costs	No controls identified	E	E	Foster innovative thinking of team to develop policies and position of Council to support this. Financial position of council will determine possibilities. Explore opportunities to learn and share across council business units.	H
Cumulative climate change impacts	Unknown impacts of climate change across existing infrastructure assets	Reduced service life and increased future maintenance and replacement costs	No controls identified	E	E	Set targets in long term financial plans related to climate change. Account for climate change related maintenance and upgrade costs in Long Term Financial Plan. Include climate risk in asset management plans (consider IPWEA Climate Change impacts on Useful life of infrastructure)	H
Cumulative climate change impacts	Lack of data collection to manage and identify climate related impacts	Potential cost implications	Current approach is responsive (based on events that occur rather than predictive maintenance programs).	E	E	Improved intelligence in asset management and GIS services to allow predictive asset management strategies to be build (e.g. catchment map)	H

Roads

Road assets are particularly vulnerable to heat and rainfall related impacts on surfaces, reducing road design life and posing safety risks for road users. This assessment identified seven high risks (for both the near and far-future) related to these impacts, as well as reputational issues related to poor road quality. There is interaction between these risks, where the impacts of road damage from heat and extreme rainfall are exacerbated by heavy vehicles, leading to more rapid surface degradation. The reactive maintenance and repair approach currently employed was not deemed sufficient to manage these risks in the short term.

The key adaptation measure to address climate related hazards on road surfaces is the careful materials selection to accommodate increased surface temperatures and a more proactive and comprehensive maintenance program to address issues early. The details of each priority risk to roads identified is provided in the table below.

Table 23. Priority climate risks to road infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to road surfaces	Increased replacement and repair costs	Maintenance and repair	H	H	Materials selection to accommodate increased surface temperatures More proactive and comprehensive maintenance program to address issues early	M
	Flood and runoff related damage to road surfaces	Increased customer complaints and reduced reputation	Maintenance and repair	H	H		M
Increased duration of heatwaves	Heat related damage to road surfaces	increased replacement and repair costs	Reactive maintenance program for cracks and issues	H	H		M
		Increased accidents leading to health and safety impacts	Crack sealing using sealants	H	H		M
Increased extreme rainfall intensity and resultant flooding	Scour from heavy downpours exacerbating damage from very hot days	increased replacement and repair costs	Reactive maintenance program for cracks and issues	H	H		M
Increased duration of heatwaves	Buses and trucks impact road surface in very hot weather becomes bumpy, reduces surface life and making them more susceptible to further deterioration	increased replacement and repair costs	Maintenance and repair Crack sealing	H	H		M
		Road safety impacts	Maintenance and repair Crack sealing	H	H		M

Bridges

Bridges have climate related vulnerabilities in terms of surface related impacts (similar to those discussed above) as well as drainage. The two priority issues related to bridges were identified as increased costs from heat-related bridge deck damage, as well as the overwhelming of bridge drainage during flood events leading to road blockages and service delivery impacts. Current reactive maintenance programs were considered insufficient to manage these risks to an appropriate level – a more proactive approach to maintenance as well as exploring heat-resistant materials were identified as potential mitigation strategies. To address drainage issues, it was suggested that a review of drainage capacity of all bridge assets should be undertaken, followed by upgrades of hotspots to accommodate for increased rainfall intensity into the future. More detail on climate risks to bridge assets is provided in Table 24.

Table 24. Priority climate risks to bridge infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased heat-related damage to bridge surfaces	Increased maintenance and repair costs	Maintenance and repair	H	H	Proactive maintenance regime to address surface impacts explore opportunities for resealing bridges with more heat-resistant alternatives	M
Increased extreme rainfall intensity and resultant flooding	Bridge drainage overwhelmed during heavy rainfall	Blocking of road and resultant traffic impacts	Maintain drainage infrastructure	H	H	Review drainage capacity of all bridge assets and upgrade hotspots to accommodate for increased rainfall intensity	M

Footpaths

Climate related impacts to footpath assets are also related to the impacts of extreme rainfall increases as well as high temperatures and heatwaves. Consequence areas for these risks included cost impacts, reputation and complaints as well as health and safety issues to members of the public. Risks related to surface damage from heatwaves and flooding are currently managed through a reactive maintenance and repair program – this approach was not considered sufficient to effectively manage these risks under a changing climate (refer to Table 25 below). The adaptation action proposed aligns with other infrastructure asset adaptation suggestions and focuses on a shift to a more proactive maintenance program to reduce these issues. Another suggestion (related to direct heat-related damage) was to increase shading of footpaths to reduce these impacts and provide a more comfortable and safe experience for users.

Table 25. Priority climate risks to footpath infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to footpath surfaces	increased replacement and repair costs	Maintenance and repair	H	H	Proactive maintenance and repair of assets	L
Increased extreme rainfall intensity and resultant flooding	Flood and runoff related damage to footpath surfaces	Increased customer complaints and reduced reputation	Maintenance and repair	H	H		L
Increased duration of heatwaves	Heat related damage to footpath surfaces	Increased trips and falls leading to health and safety impacts	Maintenance and repair	H	H		L
Increase in frequency of very hot days	Road and footpath damage	Costly to fix or upgrade	Investigating potential cool seals for road surfaces	H	H	Change materials used and design of surfaces. Plant more trees to help with shading	H

Kerb and water table

Two climate related risks were identified to these elements, each with high priority ratings for the far future. Reduced average rainfall was identified as potentially reducing the local water table, which would have potentially costly structural implications for surface assets due to soil shifts. In addition, increased rainfall intensity was identified as a source of cost impacts to kerb infrastructure, which would require increased repair under these conditions. As above, the current maintenance approach was not deemed sufficient, highlighting the need for a more proactive approach. More detail on these risks is provided in the table below.

Table 26. Priority climate risks to kerb and water table infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Reduced average annual rainfall	Reduced water table	Shifts in soil leading to structural damage to surface assets leading to increased repair costs	Maintenance and repair	M	H	Proactive maintenance regime	M
Increased extreme rainfall intensity and resultant flooding	Increased wear and tear on kerb assets	Increased repair and maintenance costs	Maintenance and repair	M	H	Proactive maintenance regime	M

Stormwater drainage network

The City of Adelaide stormwater network was associated with 12 climate-related risks, eight of which were rated as extreme in the long term. The stormwater network was associated with the highest number of extreme risks in any category and is therefore of significant concern. It was also noted through a number of interviews that flooding and stormwater capacity issues are known as the most important climate impact across infrastructure assets. All risks identified were related to the increased projected intensity of rainfall and storms, leading to a range of hazards including:

- Extreme rainfall and runoff overloading the stormwater system, which is mostly designed for 1 in 10-year storm events. In addition, much of the stormwater infrastructure is at or approaching end of life.
- Gross pollutant traps becoming blocked by debris leading to localised flooding.
- Drainage infrastructure overload due to increased water use and disposal across the City.

Key sites associated with flooding impacts across the network included:

- North Adelaide; and
- Hutt St and South Terrace in Southern Adelaide.

There were a range of current controls documented to manage flooding, however, the reactive maintenance program makes the city more vulnerable to these impacts. There are no major upgrades of the system underway currently and the gross pollutant traps are under a winter maintenance program.

The adaptation initiatives identified to manage key risks to the stormwater network centred around the development of a whole of city stormwater modelling project, including climate change projections for increased rainfall intensity, would identify key vulnerabilities and help plan for greater system capacity. The outcomes of this assessment could then be used to inform upgrade initiatives at key hotspots across the network that respond to the projected effects of climate change.

More detail on risks to the stormwater network and their adaptation actions is provided in Table 27.

Table 27. Priority climate risks to stormwater and drainage infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of storm events and lightning	Rainfall and runoff overloading CoA stormwater system, which is mostly designed for a 1 in 10 storm event.	Flooding of roadways leading to reputational impacts	No major upgrades currently underway - maintenance is reactive. Key sites include: - North Adelaide - Hutt St and South Terrace in Southern Adelaide	H	E	Whole of city stormwater modelling project (incl. climate change projections for increased rainfall intensity) to identify vulnerabilities and plan for increased capacity.	M
		Flooding of private property and safety impacts		H	E		M
		Flooding and increased damage costs		H	E		H
Increased extreme rainfall intensity and resultant flooding (high confidence)	Flooding across LGA is most important climate impact currently - for infrastructure	Increased complaints	Reactive management approach to flooding issues - much infrastructure is at end of life	H	E	Upgrade stormwater network to accommodate effects of climate change	H
	Flooding across LGA is most important climate impact currently - for infrastructure	Increased repair and maintenance costs	Reactive management approach to flooding issues - much infrastructure is at end of life	E	E		H
	Gross pollutant traps blocked by debris	Flooding of parks and roads - resulting in damage to assets and infrastructure	Maintenance schedule during winter; weather monitoring	H	E	Redesign gross pollutant traps to get them out from bridges	M
	Gross pollutant traps blocked by debris	Flooding of parks and roads unless cleared by maintenance staff - risk to staff if needs to happen during flooding		H	E		H
	Gross pollutant traps blocked by debris	Flooding of parks and roads preventing access and use		H	E		M
Cumulative climate change impacts	Infrastructure overload	Infrastructure failure	Stormwater catchment drainage plans, regional catchment flood mitigation projects and engineered solutions	H	H	Need more greening and WSUD across the city, need to advocate for SA Water to install infrastructure to allow for wider use of recycled water in buildings.	H

Traffic signals

Traffic signals are important elements of street infrastructure and are vulnerable to the effects of extreme weather events. This risk assessment identified five priority risks, all rated high for the far future. All risks were related to failure of these assets and the resultant loss of service and health and safety implications. Climate impacts included heatwave related blackouts, extreme wind and flood damage to elements of traffic signals. Currently, signal failure requires traffic police to maintain traffic flow and reactive maintenance of drainage infrastructure is undertaken to reduce flooding impacts. The following adaptation actions were identified to address these risks:

- Backup power supply to signals in key areas; and
- Proactive asset management plan to identify issues early and reduce climate-related wear and tear that could compromise their functionality.

The table below summarises key climate related risks and adaptation actions to traffic signals.

Table 28. Priority climate risks to traffic signal infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Heatwave related blackouts leading to signal failure	Increased traffic incidents and resultant reputational impacts	Traffic police maintain traffic flow	M	H	Backup power supply to signals in key areas	L
Increased intensity of extreme winds	Wind-related damage to traffic signal assets	Increased maintenance and repair costs	Traffic police maintain traffic flow	M	H	Proactive asset management plan to identify issues early	L
Increased extreme rainfall intensity and resultant flooding	Flood or extreme rainfall related damage to traffic signal infrastructure	Increased maintenance and repair costs	Maintain drainage infrastructure	M	H	Develop pro-active maintenance regime for infrastructure assets	L
	Failure of rail / road interface cabling during flood events	Transport delays and resident frustration	Maintain drainage infrastructure	M	H		
Increase in frequency of very hot days	Failure of rail / road interface cabling during flood events	increase maintenance and repair costs	Maintain drainage infrastructure	M	H	develop pro-active maintenance regime for infrastructure assets	L

Lighting and electrical

No significant risks were identified in relation to street lighting and other electrical components. Identified risks were related to extreme heat impacts on electrical components and their increased deterioration or failure. Flood and wind-related impacts were focussed on direct impacts on lighting and electrical components. All risks to these assets were related to increased maintenance and repair costs. Suggested adaptation actions to manage these risks were to select more robust materials that could withstand higher temperatures or wind gusts. Flood-affected assets could be relocated where possible, based on the outcomes of the required stormwater study.

Urban elements

Urban elements in this assessment include public events infrastructure, waste infrastructure (such as bins), recreation equipment areas and public furniture. A total of 13 risks were identified in this infrastructure asset category, with 8 of these being considered high priority. One extreme risk was identified (for the far future), relating to the potential health and safety implications of severe storms on public outdoor events. The proposed adaptation for this extreme risk was to review existing storm management plans to ensure this accounts for the increased intensity of storm events in the future. Another event-related risk was identified, related to the reduced ability to hold daytime events in summer periods due to very hot days. Responses to this risk may include a shift towards indoor events during hot periods.

Additional high risks were linked to storm-related damage to waste infrastructure and flood related damage to recreational assets. These risks could be addressed through a shift to a proactive maintenance regime to identify issues early.

Table 29. Priority climate risks to urban element infrastructure.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of storm events and lightning	Storm impacts on public events infrastructure	Health and safety risks at outdoor events	Maintenance and repair	H	E	Review and implement storm management plan for increased storm intensity for future events	M
Increase in frequency of very hot days	Increased difficulty of holding public events due to extreme weather	Reduced ability to hold daytime events due to heat related health and safety impacts	Extend hours of operation Providing onsite cooling facilities and water stations	M	M	Shift to indoor event or increase safety precautions for outdoor events	L
Increased intensity of extreme winds	High winds damaging waste infrastructure	Increased streetscape pollution and litter	Maintenance and repair	M	M	Develop proactive maintenance regime for infrastructure assets	M
		Increased maintenance and repair costs		M	M		M
		Increased litter leading to increased need for litter collection services		M	M		M
Increased duration of heatwaves	Increased smells associated with waste infrastructure	Increased collection rates and associated costs	Accept risk	M	M	Develop proactive maintenance regime for infrastructure assets	M
Increased extreme rainfall intensity and resultant flooding	Flood related damage to recreational areas	Increased repair and maintenance costs	Maintain drainage infrastructure	M	M		M
Increase in frequency of very hot days	Increase in solar radiation during hot day	UV damage to public furniture requiring more maintenance	Material selection	M	M		M

3.2.6 Other

The Other asset group includes plant and equipment and other elements that are out of the scope of this assessment. One priority risk to this category was identified, relating to the impacts of hot days on the City of Adelaide vehicle fleet. These are stored outside when not in use and are therefore vulnerable to degradation due to heat impacts. No suggested adaptation action was identified for this risk.

3.2.7 Services

The services category covers a range of the service areas offered by the City of Adelaide and was also identified as having the highest number of individual risks across all groups, with 106 risks in total. Planning and building, library services and visitor information were identified as the categories with the highest number of climate risks (refer to Table 30 below). Extreme risks for the short term were identified for street and toilet cleaning services, community gardens as well as visitor information.

Table 30. Summary of number of climate risks and ratings across City of Adelaide services.

Component	2030				2090				Total
	L	M	H	E	L	M	H	E	
City Safety	0	3	1	0	0	2	2	0	4
Cleansing (streets, toilets)	0	0	8	0	0	0	8	0	8
CoA Events	0	3	5	0	0	0	4	4	8
Community Grants	0	1	4	0	0	1	1	3	5
Community Gardens	0	8	0	0	0	0	8	0	8
Community Programs	0	2	3	0	0	0	4	1	5
Customer Service	0	3	0	0	0	0	3	0	3
Finance and Procurement	1	6	4	0	1	1	8	1	11
Homeless Support	1	0	4	0	0	1	0	4	5
Horticulture	0	1	3	0	0	1	1	2	4
Information Management	0	2	2	0	0	2	2	0	4
Library Services	0	3	8	0	0	2	7	2	11
Maintenance	0	1	3	0	0	1	3	0	4
People (HR)	0	4	4	0	0	0	8	0	8
Planning and building	3	9	4	1	2	8	4	3	17
Visitor Information	14	0	0	0	0	11	3	0	14
Waste Collection	1	0	0	0	1	0	0	0	1
Total	20	46	53	1	4	30	66	20	120

This section will discuss the priority climate related risks to the broad range of services offered by the City of Adelaide.

City safety

City safety has an important role to ensure the safety of resident and visitors to the City of Adelaide. Several priority climate risks were identified, with the majority being related to the impacts of increased temperatures on the level of visitation of the city. It was noted that increased average temperatures would bring additional people, highlighting the potential implications of a slight warming of the climate. Consequences of this risk included potential health and safety impacts due to inadequate resourcing. A key adaptation action related to this risk is additional resources to support the safety team.

An additional risk was identified that was related to heatwave impacts on staff health and safety, which could be mitigated through the expansion of the current approach to reallocate resources during hot spells. More detail on climate risks to the City safety team are summarised in the table below.

Table 31. Priority climate risks to the city safety service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased public activity in the city	Current resources spread thin leading to potential increase in health and safety impacts during heatwaves	Work schedules are altered at certain times of the year	M	H	Additional resources sought to support more team	M
Increased duration of heatwaves	Exposure of staff to extreme weather	Decreased workload and risk to staff health	Outdoor staff are reallocated work that minimises outdoor exposure	H	H	Outdoor staff reallocated to other jobs that do not require exposure to extreme heat	M

Cleansing (streets, toilets)

A range of climate related risks were identified to the cleansing services team and operations. Projected wind intensity increases were associated with the increased spread of pollen and dust, leading to both an increased need for street cleaning services as well as asthma related health and safety impacts for staff members. Additional priority risks were also identified in relation to increased temperatures and its effect on staff health and safety when undertaking work outdoors. The control measure for this risk was associated with an additional cascading risk related to an inability to adequately deliver services due to increased heat-related working restrictions. No adaptation actions were identified through the stakeholder interviews.

More detail on climate risks to the cleansing team are summarised in the table below.

Table 32. Priority climate risks to the cleansing service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased intensity of extreme winds	Increased spread of dust and pollen (northerly winds)	Increased frequency of street, footpath and public realm required	None identified	H	H	Accept risk	H
	Increased spread of dust and pollen (northerly winds)	Increased risk of asthma, hay fever and other respiratory illnesses	Staff wear P2 masks and other PPE	H	H	Accept risk	H
Increase in frequency of very hot days	Risk to outdoor staff health and safety	Staff are reallocated to indoor duties and staff hours are altered to work in the cooler parts of the day	Staff start earlier or undertake work indoors and only respond to high priority outdoor tasks	H	H	Accept risk	H
	Reduced ability to clean the public realm, due to restrictions of staff working in	Loss of cleansing of public realm, more dust, pollen, leaves, litter in the public realm.	Staff start earlier or undertake work indoors and only respond to high priority outdoor tasks, however, staff	H	H	Accept risk	H

	outdoor environments		are limited in their work hours due to noise restrictions set by the EPA.			
--	----------------------	--	---	--	--	--

Events

Major events at the city of Adelaide are frequently outdoors and are therefore more susceptible to climate related impacts. Heat related impacts are of key concern due to the direct impacts on patron comfort and safety. Very hot days were associated with potentially reduced patronage at outdoor events, as well as the reduced use of public transport to access events. These risks were rated as extreme for the far future, and adaptation actions to address these included:

- Create artificially cool spaces for events;
- Continue to prioritise greenspace due to the thermal properties of greenspace compared to paved surfaces;
- Utilise misting systems and create shade areas to reduce heat exposure;
- Continue investment into Urban Heat Island (UHI) mitigation strategies;
- Create cool corridors around public transport hubs to encourage people to utilise public transport; and
- Use indoor spaces for events more frequently.

Increased hail and storm intensity was also identified as a source of significant risk, linked to reduced desire for patrons to attend events as well as direct health and safety impacts. The key opportunity to reduce the exposure of events to storm impacts is a shift towards more indoor events, especially in the far future.

More detail on climate risks to Council events are summarised in the table below.

Table 33. Priority climate risks to the Council events service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Unpleasant for people to be outdoors	Reduction in the number of people visiting events during very hot days	Events are planned during the evening, night time and early in the morning where possible.	H	E	Create artificially cool spaces for events.	M
	Unpleasant for people to be outdoors	Reduction of people travelling to events via public transport on very hot days	Events are shaded through the use of the parklands, marquees, indoor spaces	H	E	Create cool corridors around public transport hubs to encourage people to utilise public transport	H
Increased intensity of hail storms	Unpleasant for people to be outdoors	A reduction of people in the city and loss of spending in local businesses	Increased use of indoor spaces and semi permanent weather proof outdoor spaces	M	E	Increase options for rental of indoor spaces and protected outdoor spaces	L
	Hail damage	Increased danger to people	None	M	H	Increase use of indoor spaces and protected outdoor spaces	L

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Flooding of event spaces	A reduction of people in the city and loss of spending in local businesses	Planning, risk assessment	M	H	Increase use of indoor spaces and protected outdoor spaces	M
Increased intensity of storm events and lightning	Danger to people in outdoor spaces	Risk of lightning strike	Planning, risk assessment	H	E	Increased use of indoor spaces	L
Increased intensity of extreme winds	Not suitable for marquees or other temporary structures	Reduction in people's perception of safety	Planning, risk assessment	H	H	Increased use of indoor spaces	L
Increased duration of heatwaves	Build up of heat due to the UHI effect	Reduction in people visiting the city due to a reduction in comfort from heat	Events planned at times of reduced heat i.e. mornings, evenings, night. Indoor events	H	H	Increased use of indoor spaces	L

Community Grants

The City of Adelaide community grants provide funding for worthy causes across the community. A key concern identified through this risk assessment was the increased demand for funding from community organisations addressing homelessness. It was identified that a range of climate impacts may lead to this hazard, including heatwaves, flooding and storms. The key consequence of this hazard is the reduced ability to fund other programs due the dramatic potential increase in demand from this community sector. No specific adaptation measures to address this issue were identified, however, the interviewee highlighted the complexity of the issue and the likely need for further research in the space.

An additional priority risk to the community grants program was related to the loss of Council funded events due to their increased exposure to climate related effects. A key adaptation action for this risk was the encouragement of flexibility around the timing and location of events to reduce this exposure and the resultant health and safety risks.

More detail on climate risks to community grants are summarised in the table below.

Table 34. Priority climate risks to the community grants service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Reallocation of funds towards programs, rather than events that may be affected by severe heat	Loss of CoA funded community events	Events must meet stipulations to minimise risk of cancellation as a result of weather	H	H	Encourage/stipulate use of indoor spaces for outdoor events or only early morning, evening and night events	M
Increased duration of heatwaves	Increased demand for funding from community based organisations addressing homelessness	Increased reliance on limited resource funding, increased risk for vulnerable communities, reduced ability to fund other less needed community programs	A focus on increased shaded areas, continued greening of spaces to cool local environment, research into the adoption of high heat reflecting surfaces	H	E	<i>Requires further research and understanding, beyond the scope of this analysis</i>	E
Increased extreme rainfall intensity and resultant flooding				H	E		E
Increased intensity of storm events and lightning				H	E		E

Community Gardens

Community gardens play an important role in the community, and due to their susceptibility to climate related effects, a range of climate risks were identified. A key climate related impact was the loss of plant life in gardens due to increasingly severe hot days and heatwaves. This was also considered a potential loss of support for the community gardens. Heat related impacts could be mitigated through the careful selection of species as well as changing planting patterns to suit the changing climate. Also identified was the opportunity to capture and use rainfall to reduce the garden's reliance on mains water. Watering schedules may also be updated to account for severe heatwaves or hot days to reduce garden impacts.

An additional risk area identified was the cumulative impacts of climate change leading to a lack of suitability of some plants to the Adelaide context. This was outlined as a moderate risk in the short term, with a long-term requirement to adapt the planting schedule to the changing climate.

More detail on climate risks to community gardens are summarised in the table below.

Table 35. Priority climate risks to the community gardens service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Plants die from heat	Plants require protection from the sun via shade	Planting or heat tolerant species, increased watering	M	H	Choose heat tolerant species to plant over the warmer months, plant seasonal food plants over the cooler months.	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Plants require more water to survive hot days	More water used for irrigation purposes	Planting or heat tolerant species, increased watering	M	H	Capture rainfall locally for use over summer to reduce reliance on mains/GAP water. Water more frequently prior to a heat wave, late in the evening. Invest in shade structures to reduce direct sunlight	L
Increased duration of heatwaves	Reduced ability of community to maintain plants in extreme heat conditions	Plants may die or reduce vigour	Planting or heat tolerant species, installation of automatic watering system	M	H	None required	M
Increased extreme rainfall intensity and resultant flooding	Increased hail storms	Hail damage to produce and plants	Some gardens are shaded and protected to some degree	M	H	Installation of shade cloth where necessary. Accept the risk. Replant where necessary	H
Cumulative climate change impacts	Alteration of traditional weather patterns	Plants that once grew well in the Adelaide climate, now are not suitable for the new climate	None	M	H	Seek hardier plants, originating from climates that resemble the new climate	H
Cumulative climate change impacts	Gardening becomes undesirable due to altered weather	Loss of community support for community gardens	Community education and engagement programs exist in the community. There are indoor spaces for community to meet	M	H	Create partially shaded environments for gardening and organise times to avoid heat of the day or extreme weather events	L
More frequent & severe droughts	Reduced soil moisture	Increased watering demand throughout the year	Gardens receive watering via a dripper system	M	H	Choose some hardy and drought tolerant plant species. Capture	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Reduced average winter rainfall (high confidence)	Reduced soil moisture	Increased watering demand through winter	Gardens receive watering via a dripper system	M	H	stormwater via rainwater tanks Utilise wicking beds and other systems for drought scenarios	L

Community Programs

There were diverse and significant risks related to community programs, including one extreme long-term risk related to the business continuity impacts of cumulative climate change effects. It was noted that local businesses have poor adaptive capacity to respond to temperature change and their resultant impacts on customer behaviour. An adaptation action to increase business and community training and awareness in this space was identified as potentially reducing this risk.

In addition, hot days and heatwaves were also associated with impacts to local amenity and visitation. It was acknowledged that the City of Adelaide has a focus on urban cooling strategies currently, however, these risks were still identified as being of high priority.

Flood related impacts on outdoor community programs were also identified as a high risk given the potential for loss of some outdoor spaces during these periods.

More detail on climate risks to community programs are summarised in the table below.

Table 36. Priority climate risks to the community programs service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Threat to outdoor based community programs	Loss of community use of outdoor spaces	Risk matrix and assessment consider extreme weather in relation planning	H	H	Accept risk	H
Increase in frequency of very hot days	Loss of use and amenity of council assets. Heat will negatively influence resident and visitor behaviour and people will not utilise council assets during hot spells	Reduction in well-being of the community, restricted exercise times, people forced indoors more often and for longer periods of time	Council has a focus on urban cooling strategies through the sustainability team	M	H	Accept risk	H
Increased duration of heatwaves	Threats to events in the summer period	Tourism events may need to be moved to night time events or to another time	Council has a focus on urban cooling strategies through the	M	H	Accept risk	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
		of year so they will still attract visitors.	sustainability team				
Increased extreme rainfall intensity and resultant flooding	Threat to outdoor based community programs	Loss of community use of outdoor spaces	Risk matrix and assessment consider extreme weather in relation planning	H	H	Accept risk	H
Cumulative climate change impacts	Threat to business continuity. Many businesses do not have business continuity plans and are not prepared to adapt to conditions associated with climate change	Loss of business in the CoA area as businesses have poor adaptive capacity to respond to increased average temperatures and altered consumer behaviour arising from increased temperatures	Disaster Resilience Officer employed by CoA to help educate and upskill residents and businesses in adapting to climate change and other disasters	H	E	Increased community and business training in tandem with peak business bodies, such as Business SA, East Adelaide traders etc.	H

Customer Service

Several climate risks to the customer service team were identified. These were all associated with the cumulative change in climate and included:

- Increased need to reimburse money due to event cancellation;
- Inadequate resourcing to manage the shift towards social media and call centres due to diverse climate impacts; and
- Increases in infringement notice disputes, leading to increased community and staff stress.

Several current controls exist for these risks however each was considered of high priority in the long term. Proposed adaptation actions to manage these impacts were associated with the need for consistent approaches and messaging to make staff actions and decisions more clear. This could be achieved using decision trees or checklists and a CRM system.

More detail on climate risks to customer service are summarised in the table below

Finance and Procurement

Six priority climate risks were identified for the City of Adelaide's Finance and procurement team, with one extreme risks identified for the far future. The most important risk identified was related to the cumulative impacts of climate change and that, across the organisation, Council may be unprepared for the long-term implications of climate change, many of which may be identified through this risk assessment. It was noted that many of the policies' stated adaptation and mitigation strategies had not yet been tested – and that undertaking tests for their efficacy would support improved policy and initiative development to better protect Council operations and assets against the diverse and complex risks associated with climate change.

Table 37 - Priority climate risks to the customer service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Events/activities cancelled in very hot or poor weather situations	Need to reimburse monies	Payment plans in place where needed	M	H	Accept risk	H
Cumulative climate change impacts	Increased demand on social media platforms and call centres	Current staff inadequately resourced	Flexibility in staff responsibilities - able to move staff from less demand areas to higher demand areas	M	H	Need consistent approach and messaging through Council - and consistent templates and thresholds/triggers identified.	H
Cumulative climate change impacts	Infringement disputes increase	People are more unhappy; staff under stress	Payment plans available; business continuity plan now in place (since COVID19); authorities to wave expiations if needed; monitoring of demand/dispute numbers to be able to forecast response need	M	H	Decision support-tree/matrix applied council wide to identify what action to take and when Internal checklists to ensure all information if provided to all relevant staff	H

Cumulative climate impacts and their potential link to increased disease pandemics was also identified as a potential risk area, especially in light of the effects of the recent COVID-19 outbreak. The ability for Council to seek payment for fines and infringements from residents was identified as a potential issue during these periods, when broader economic implications are taking place that might increase the negative perception of Council. A strategy to mitigate this risk was the potential suspension of expiations during times of social and economic stress. This may also be applied in the context of widespread impacts from extreme weather events such as storms or bushfires that impact upon the community.

Additional risks related to the damage to Council assets (including heritage buildings) were also identified, linked to the impacts of heatwaves, floods and storms. The Finance and Procurement team have a role to support increased resilience in assets through the procurement process. It was noted that the current procurement policy has a focus on sourcing suppliers from ethical and environmentally responsible suppliers, which includes sourcing products and services that help council respond to the impacts of climate change.

More detail on climate risks to Finance and Procurement are summarised in the table below.

Table 38. Priority climate risks to the finance and procurement service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Increased disease pandemics	Increased negative perception by public	None	H	H	Establish protocols for suspending expiations during times of extreme financial and social stress.	M
More frequent & severe droughts	Reduced available water for council plants	Increased water demand to supply sufficient water for plants		M	H	Forecasting predicted climate change predictions to plan for increased costs of watering	M
Increased intensity of hailstorms	Increased maintenance of council managed buildings	Damage to assets as a result of poor hail resistance of building materials	Certifications of businesses, policies, foot printing are reviewed as part of the procurement process. This includes sourcing products and services that help council respond to the impacts of climate change.	M	H	Accept risk	H
Increased intensity of storm events and lightning	Increased maintenance of council managed infrastructure	Damage to assets as a result of poor flood mitigation measures	Council are assessing the predicted impacts on infrastructure in the CoA area.	M	H	Accept risk	H
Increased duration of heatwaves	Increased maintenance of council managed infrastructure	Increased frequency of maintenance and repair of council heritage listed assets associated with increased heat	Procurement team are working closely with the Asset and Property Team in council to assess the impacts climate change will have on council.	H	H	Accept risk	H
Cumulative climate change impacts	The cumulative effects of climate change	Council may be unprepared for the long-term	Council have not tested many of the adaptation and	H	E	Testing of plans and policies to assess their efficacy	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
	haven't been assessed	implications of climate change	mitigation strategies that are proposed in their policies				

Homeless Support

Homeless support services identified a range of extreme rated climate risks for the far future, all related to the effects of increased hot days and heatwaves on the homeless population. Importantly, the effects of climate change in the City of Adelaide region may drive increased homelessness in the future. Heatwaves and hot days were identified as driving increased requirements for emergency services for the homeless as well as heatwave related blackouts reducing the ability of the homeless to access information via the internet at community health centres. Current controls to mitigate these risks include:

- Provision of additional water for primary homeless people;
- Collaboration with other homeless services;
- Communications about how to prepare for hot weather; and
- Increased monitoring of people in distress.

Additional actions that may be implemented to further address these risks to the homeless population include a range of initiatives such as:

- Free swim and locker passes at swimming pools;
- Complementary movie passes noting that cinemas have cooling; and
- Afterhours cool places program.

More detail on climate risks to Finance and Procurement are summarised in the table below.

Table 39. Priority climate risks to the Homeless Support service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased temperatures reduce thermal comfort for the homeless and creates risk of heat stress	Increased number of health and safety emergencies for the homeless	Provision of additional water for primary homeless people	H	E	Free swim and locker passes at swimming pools Complementary movie passes noting that cinemas have cooling Afterhours cool places program	M
	Extreme heat-related blackouts at community centres	Homeless people are unable to access information via the internet at community centres which may relate to their individual health and well being	Communications about how to prepare for hot weather Increased monitoring of people in distress Collaboration with other homeless services;	H	E		M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased duration of heatwaves	Increased temperatures reduces thermal comfort for the homeless and creates risk of heat stress	Increased number of health and safety emergencies for the homeless		H	E		M
	Heatwave-related blackouts at community centres	Homeless people are unable to access information via the internet at community centres which may relate to their individual health and well being		H	E		M

Horticulture

Given the significant implications of climate change on green infrastructure, the Horticulture service area was associated with several important climate related risks. The increased projected frequency of very hot days was identified as a key concern to both plants and animals across the Council area. Tree and plant deaths were associated with increased costs to irrigate and maintain parkland spaces for public amenity. The expectation by the community of parkland to be green all year is currently supported by the use of 750 megalitres of water for irrigation per year. An adaptation measure to broaden the water supply was to further invest in water sensitive drainage systems to allow for capture and storage of stormwater for irrigation purposes.

The increased projected intensity of rainfall was also identified as a key risk to the Horticulture service area due to the impacts of flooding in parklands and properties across the LGA. Currently, some water sensitive design elements are reducing peak flows, however expansion of these assets was identified as a key adaptation strategy to reduce the impacts of this risk.

More detail on climate risks to the Horticulture service area are summarised in the table below.

Table 40. Priority climate risks to the Horticulture service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Heat stressed plants (trees, groundcover, bushes)	Increased use and therefore costs of GAP irrigation water and mains supply water to reduce heat stress	Community expects the parklands and parks to be green all year. This requires significant (750,000 megalitres) of water.	H	E	Invest in further WSUD elements to capture and store stormwater. Shandy stormwater with GAP water to reduce reliance of mains supply water. Implement water	M

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
						sensitive city plan.	
Increase in frequency of very hot days	Heat stressed animals (Grey-Headed Flying Fox)	Death of animals that can spread disease, animals die in places where they can be accessed by the public, children etc	Education sessions around Grey-Headed Flying Foxes	H	H	Signage and locations are continually upgraded with information and warnings	M
Increased extreme rainfall intensity and resultant flooding	Limited capacity to store stormwater or reduce impacts of flooding on parklands and properties within the CoA	Increased flooding of parklands and properties within the CoA	Some WSUD elements in the CoA area help to reduce peak stormwater flows	H	E	Upgrade of the stormwater network to incorporate further WSUD elements to store greater amounts of stormwater and respond to peak flows water. Implement water sensitive city plan.	L

Information Management

The Information Management service area identified two priority climate risks, each rated high for the near future. In relation to the cumulative impacts of a changing climate, it was noted that information on changes or processes is not currently consistently communicated (both internally and externally). The effects of climate change may exacerbate this issue, leading to confusion amongst staff and mixed messages being provided to public leading to public dissonance. Currently, the Customer Service team employs templates for communications, however it was identified that there is a need for a consistent approach and messaging through Council, with consistent templates and thresholds/triggers identified. Other initiatives to support clearer communications include:

- Decision support-tree/matrix applied council wide to identify what action to take and when; and
- Internal checklists to ensure all information is provided to all relevant staff.

Another key vulnerability for the information management team was the heatwave-related failure of HVAC systems that maintain current data centres. It was noted that there are three air conditioning units in place to manage very hot days, but this is inadequate given likely increases in length and severity of heatwaves into the future. Approximately 50% of data is in the cloud, which significantly reduces Council's vulnerability to this risk. Further adaptation to address this risk could be achieved through increasing the shift to cloud computing to reduce need for onsite datacentres and relocates the issue to the datacentre service provider.

More detail on climate risks to Information Management are summarised in the table below.

Table 41. Priority climate risks to the Information Management service area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Information on changes or processes not consistently communicated (internally and externally)	Confusion amongst staff and mixed messages being provided to public leading to public dissonance	There are some templates used by customer service team	H	H	Need consistent approach and messaging through Council and consistent templates and thresholds triggers identified.	L
Increased duration of heatwaves	Heatwaves leading to failure of datacentre HVAC systems and resultant damage to data centre infrastructure and productivity	Increased maintenance and repair costs	Three aircon units in place to manage very hot days. 50% of data is in cloud, which significantly reduces Council's vulnerability to this risk.	H	H	Shift to cloud computing reduces need for onsite datacentres and relocates the issue to the datacentre service provider. Asset Management team is responsible for HVAC provision.	L

Library Services

Library services are vulnerable to a range of climate risks, related both to the operation of the library asset as well as impacts on community behaviour and preference. Very hot days and storm impacts in the future were associated with the following effects:

- Library event cancellation;
- Staff health and safety risks in outdoor activities;
- Reduced visitation of the city; and
- Overall reduced vibrancy of the city due to these impacts.

Current management approaches to these issues is centred around the Hot Weather Policy that aims to reduce staff exposure and a range of adaptation responses such as shade provision and drinking water. Remote access to reduce the need for travel was also identified as an opportunity to reduce risk. A continued shift toward moving events to cooler part of the day as well as the provision of cooling infrastructure such as shading was identified as suitable adaptation actions to further address these risks.

Heatwaves were identified as having an implication for the library assets themselves, leading to greater strain on HVAC systems to provide thermal comfort and to issues with internal lift infrastructure. This is a key concern as libraries are deliberately open on days of extreme weather as a safe and comfortable place for the community, so need to be operational. Proactive repair and upgrades of HVAC and lift systems was identified as a key risk mitigation opportunity to ensure a safe and comfortable space as demand for library services increases into the future.

More detail on climate risks to Library Services are summarised in the table below.

Table 42. Priority climate risks to the Library Services area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Library promotional activities and services at outdoor events are compromised	Staff do not attend outdoor events. Events may be cancelled.	Hot weather policy dictates allowance for staff exposure to heat and adaptation response, such as shade, drinking water availability etc	H	H	Events may occur in cooler parts of the day. Contingencies may be put in place - shade, drinking water, outdoor fans.	M
	Staff health and safety	Reduced ability for library staff to promote services to the community in the outdoors. i.e. in Rundle Mall	Hot weather policy	H	H	Accept risk	H
	Public less likely to visit events during this time	Reduction of people visiting the CoA, loss of spending in the city	Host events in indoor spaces, at night or utilise shaded outdoor spaces. Some events are live streamed through the internet.	H	H	Events are planned for evenings and nighttime periods or early morning over summer.	M
	Events are cancelled	Reduced city vibrancy and loss of attraction	Some events are live streamed through the internet. More events planned for cooler months instead of over summer.	H	E	Accept risk	E
Increased duration of heatwaves	Strain on air-conditioning service. Air-conditioner has not operated properly on hot days	Reduced thermal comfort of staff and public in the libraries	Libraries are deliberately open on days of extreme weather as a safe and comfortable place for all of the community. Repair of air-conditioning	H	H	Increased servicing of air-conditioners or upgrade of air-conditioning	M
	Increased temperatures inside buildings	Failure of equipment. For example, lifts often break-down in hot weather. May impact on visitor enjoyment of indoor event spaces.	Lifts are serviced as needed	M	H	Accept risk	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Public less likely to visit events during this time	Reduction of people visiting the CoA, loss of spending in the city	Events hosted indoors	H	E	Create large sheltered spaces within the public realm to allow for mass public events, that will not be disturbed by storm events	H
Increased intensity of storm events and lightning	Library promotional activities and services at outdoor events are compromised	Staff do not attend outdoor events. Events may be cancelled.	Staff abide by weather policy, that covers risk of storms and lightning	H	H	Events are planned for indoor spaces. Events require shelters	M
	Public less likely to visit events during this time	Reduced revenue for CoA businesses	Live streaming of events. Use of indoor spaces for events	H	H	Accept risk	H

Maintenance

The Maintenance Service area was associated with two priority climate risks. Flooding was identified as an important impact area for the stormwater network (explored in more detail in Section 3.2.5). Damage to this infrastructure was identified as a key issue and it was noted that upgrades to this infrastructure and to encouraging building owners to install water tanks could address these risks through reducing peak flows. The second priority risk was related to very hot days, and their impacts on energy demand for cooling work areas. Current controls were not deemed effective at controlling this risk, suggesting the need for adaptation actions in the form of increased building insulation and passive cooling design elements to reduce energy demands. These risks are described in detail in the table below.

Table 43. Priority climate risks to the Maintenance Services area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased extreme rainfall intensity and resultant flooding	Limited capacity of the stormwater network to cope with increased high intensity rainfall events	Damage to infrastructure as a result of flooding	Some WSUD elements in the CoA area help to reduce peak stormwater flows Emergency response to flooding events	H	H	Upgrade stormwater network to increase the capacity for peak flows. Invest in more permeable pavement footpath options. Incentivise building owners to install water tanks.	H
Increase in frequency of very hot days	The temperature inside work buildings increases as a result of outside temperatures	Increased energy demand and associated costs	Investment in PV panel, purchase of green energy	H	H	Increased investment in insulation, passive design elements	H

Planning and building

The planning and building service area is concerned with planning and approvals for developments across the Council area. Key climate risks related to this services area were related to the cumulative

physical impacts of climate change leading to reputational, health and safety and financial implications for Council. Three key hazards relating to these were identified:

- Current DPTI Guidelines are not considered suitable for ensuring resilience to a changing climate, leading to increased potential issues for community members due to increased climate impacts;
- The building code does not meet best practice for resilient building; and
- Developments undertaken on Council land may not meet future resilience requirements which may lead to retrofit and repair requirements.

These issues were all rated as high to extreme for the near and far future as current controls were not deemed sufficient to meet these emerging challenges. Adaptation actions to address these issues included:

- Further the influence of CoA on DPTI planning requirements to be more proactive in resilient building practices; and
- Ensure that large developments on Council land meet resilience requirements for future climate.

Other climate risks were linked to potential delays in the undertaking of inspections due to hot weather. Currently, Council has restrictions on maximum temperatures under which staff can work outdoors to reduce health risks. In future, Council may consider expanding the range of times during which compliance assessments are undertaken or to advocate for changes in how assessments are undertaken to reduce delays in the development approval process.

Climate risks to Planning and Building are summarised in the table below.

Table 44. Priority climate risks to the Planning and Building area.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Cumulative climate change impacts	Current DPTI Guidelines not suitable for ensuring resilience to changing climate, leading to increased issues for community members due to increased climate impacts	Reputational impacts	Planning team currently trying to influence DPTI through submission on planning and design for better resilience and sustainability outcomes.	H	H	Further influence on planning requirements Develop more specific, draft state planning policies document.	H
	Reliance on building code for resilience to future climate change does not meet best practice for resilient building	Impacts to community health and safety		E	E	Further influence on planning requirements	M
	Developments undertaken on Council land not meeting future resilience requirements, leading to need for retrofit and repair	Increased maintenance and repair costs		H	E	Ensure developments on Council land meet resilience requirements for future climate	H

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increased average temperatures	Increased daytime temperatures reducing the hours per day that compliance officers can conduct assessments	Delays in building inspections	Council restrictions on maximum temperatures under which staff can work outdoors	M	H	Expand range of times during which compliance assessments are undertaken	L
Increase in frequency of very hot days	Increased daytime temperatures reducing the hours per day that compliance officers can conduct assessments	Delays in building inspections		M	H	Advocate for changes in how assessments are undertaken	M

Visitor Information

Priority climate risks related to the Visitor Information services team were both related to the potential increase in demand for use of the centres as cool refuges. This would have cost implications for Council in terms of maintaining thermal comfort in the space. Current controls were deemed adequate for the short term, however in the long term it was suggested that the following adaptation actions be implemented:

- Building design principles that optimise passive cooling; and
- Adopt energy efficiency measures.

Table 45. Priority risks to Visitor Information services.

Climate impact	Hazard	Consequence	Controls	2030	2090	Proposed Adaptation actions	Residual risk
Increase in frequency of very hot days	Increased number of people wanting to use the visitor centres as cool refuges	Increased energy costs for cooling	Council has a power purchase agreement which determines energy costs Invest in energy efficiency measures	L	H	Use building design principles that optimise passive cooling	L
Increased duration of heatwaves				L	H	Adopt energy efficiency measures	L

Waste Collection

There were no priority risks associated with City of Adelaide's waste collection services.

4 Transition risk and opportunity materiality assessment

The transition risk assessment considered the risks and opportunities posed to the City of Adelaide's services, assets and infrastructure by a transition to a low carbon economy.

4.1 Overview

Given uncertainties around future carbon emissions reductions, it is becoming increasingly important for organisations to prepare for a range of climate change futures to promote resilience, including addressing risks from physical climate change, as well as from the social and economic transition to low carbon economies. Increasingly ambitious carbon reduction targets require equally ambitious mitigation strategies, which may have diverse implications for organisations and society. This links closely with the goals of the Carbon Neutral Adelaide initiative, which aims to make Adelaide the world's first carbon neutral city. Many initiatives and strategies will need to be employed to drive the required reductions in carbon emissions.

Potential risks resulting from the transition to a low carbon economy may include those associated with shifts in the following areas:

- Policy;
- Regulation;
- Technology;
- Markets and business models; and
- Reputation and confidence.

Beyond the physical risks explored in Section 3 of this report, these may have important implications for the City of Adelaide's operations that should be considered in resilience planning.

The key aim of the transition risk assessment was to identify and prioritise climate transition risks and opportunities relevant to the City of Adelaide.

4.2 Method

The methodology employed to undertake this assessment aligns with key guidelines such as those described in the Financial Stability Board's Taskforce for Climate-related Financial Disclosures (TCFD). The key steps of the method are summarised in Figure 7 below.



Figure 7 - Summary of the transition risk and opportunity materiality assessment process.

Task 1: Selecting future scenarios

The first stage of the assessment was to identify and adopt internationally recognised scenarios and their characteristics to inform the future characteristics of a global low-carbon future. This helps to define a future by which to identify transition risks and opportunities. A range of scenarios have been developed that make complex assumptions about future economic, demographic and physical environmental characteristics. Low-carbon future scenarios typically suggest a rapid reduction in global carbon emissions in line with the Paris Agreement, achieving global net zero emissions by the 2060s. The scenarios selected for this assessment included

- Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) 2.6 (Meinshausen, Smith, & Calvin, 2011); and
- International Energy Agency (IEA) Sustainable Development Scenario (IEA, 2020).

Along with demographic and economic assumptions, these scenarios include assumptions around a range of metrics that inform global policy initiatives, energy sources that are associated with dramatic reductions in carbon emissions. Key elements defined in low-emissions scenarios through this assessment included:

- Global energy mix;
- Carbon pricing through time;
- Transportation changes and electrification; and
- Built environment energy efficiencies.

Assumptions of these scenarios are global, and do not define the potential future characteristics at the country scale.

Task 2: Define local parameters

This stage of the assessment aimed to employ the low emissions scenarios described above and develop an application of these scenarios in the Australian context. The following documents were employed to inform this element of the project:

- Corporate TCFD disclosures e.g. (Colonial First State, 2020) (CBA, 2019); and
- Local think tanks e.g. (Beyond Zero Emissions, 2010).

Information from these documents was used to inform a picture of aggressive carbon emissions reduction in Australia.

Task 3: Workshop risks and opportunities

Information developed through tasks 1 and 2 above was summarised in a series of slides and presented to a range of City of Adelaide stakeholders (attendees provided in Appendix C). Following the presentation, a workshop was facilitated to identify the potential implications of a global low-carbon trajectory on the operations of the City of Adelaide. A preliminary set of risks and opportunities related to the key transition themes was discussed with participants, leading to the development of a shortlist of key issues to be discussed in further detail.

Task 4: Evaluate and document findings

Following the workshop, a register of risks and opportunities was developed and shared with participants for review and refinement. The basis for ratings is summarised in Table 46. The register includes a materiality rating for each risk and opportunity, which was employed to prioritise the findings of the assessment, as well as potential treatment actions to mitigate the risk. Materiality ratings were developed and scored in consultation with City of Adelaide stakeholders. The Transition Risk and Opportunity Register is provided in a separate spreadsheet provided to Council.

4.3 Results summary

The assessment covered transition issues across broad themes related to a rapidly decarbonised economy. This section highlights the key findings of the assessment, summarising the priority (high and extreme) risks and opportunities identified in this materiality assessment.

4.3.1 Risks

A total of 32 transition risks to the City of Adelaide were identified through the workshop, covering specific Council assets, business units and risks to Council's operational goals and community.

Priority risks to the City of Adelaide, which are those with high materiality, are summarised below.

Table 46. Description of the materiality of risks and opportunities used for the transition assessment.

Rating	Risk description	Opportunity description	Timeframe for action
Low	Low priority risk with immaterial impact on Adelaide operations. BAU approach will manage risk implications.	Low priority opportunity with immaterial impact on Adelaide operations.	20 – 50 years (long)
Moderate	Moderate priority risk with lower probability of detrimental implications to operations. City of Adelaide to consider what can be done to manage risk implications in the medium term.	Moderate priority opportunity with lower probability of positive implications to operations. City of Adelaide to consider opportunity in the medium term.	10-20 years (medium)
High	High priority risk with significant detrimental operational implications. City of Adelaide to consider ways to eliminate or reduce exposure to High risks in short term.	High priority risk with significant beneficial operational implications. City of Adelaide to explore implementation of opportunity in short term.	5 – 10 years (short_
Extreme	Extreme priority risk with immediate or potential future harmful impacts to operations. City of Adelaide to eliminate risk or prioritise adaptation actions to manage impacts in immediate term.	Extreme priority opportunity with immediate or potential future benefits to operations. City of Adelaide to explore in immediate term.	0 - 5 years (immediate)

Aquatic centre and gas utilities

The City of Adelaide Aquatic Centre was associated with one high materiality transition risk related to the gas-powered heating of the pool infrastructure. The use of gas is the second highest source of carbon emissions for the City of Adelaide, and the Aquatic Centre is the highest gas user across the City of Adelaide portfolio. The Aquatic Centre is vulnerable to the introduction of a carbon emissions tax scheme, which would dramatically increase its operational costs given its comparatively large carbon footprint.

A potential treatment action for this high-risk asset is the development of a gas transition or exit strategy to reduce the reliance on gas for energy, building resilience to carbon emissions pricing initiatives in Australia.

Business model

The City of Adelaide business model is vulnerable to the impacts of changing markets away from tourism and the international student market. It was identified that climate-related market changes in travel could drive the need for shifts in the city's revenue model. While this indirect risk is not within the City's direct control, there are opportunities for the city to support the diversification of less carbon intensive revenue generation in the region.

Fleet vehicles

A key risk area in the materiality assessment was the identification of the vulnerability of the City of Adelaide's large vehicle fleet to carbon emissions trading schemes. This includes heavy as well as light vehicles from across the City's operations. Putting a price on carbon would likely devalue high emissions vehicles, with potentially significant implications given fleet vehicles are an important component of the City of Adelaide's asset portfolio.

Carbon management and procurement

Stakeholders identified an extreme materiality risk through the workshop related to the range of carbon management initiatives being undertaken at the City of Adelaide that hinder a more integrated approach. It was noted that a procurement policy including climate risk and emissions mitigation has been drafted, but further improvements could be made to better integrate emissions reduction initiatives with resilience and risk planning.

Planning

The transition to a low-carbon economy may have significant implications for the City of Adelaide's planning team. Importantly, the recently released Draft State Planning Policies will inform development of the policies contained in the future Planning and Design Code. State Planning Policy 5 requires developers to "minimise the adverse effect of decisions made under the Act on climate change and promoting development that is resilient to climate change". This policy highlights a current trend towards increased sustainability performance of the build environment. Two priority risks were identified in relation to increasingly stringent planning and development requirements:

- Reputation risks related to the current planning code and how it is being applied. This includes the implications of a reported lack of enforcement of code requirements, leading to lower carbon performance developments.
- Resourcing risks related to the need to upskill team members to accommodate and enforce policy changes that drive increasingly stringent carbon performance of new buildings.

Property

Given the City of Adelaide's large property portfolio, shifts in building performance requirements as well as the development of a carbon price may lead to several important transition impacts related to operational and capital costs, as well as asset value. The potential need to retrofit large and important sites (e.g. Central Market) for improved energy efficiency would require significant capital investment and was identified as a high materiality risk. Currently, some existing energy efficiency and upgrade programs are in place (e.g. Central Market upgrade of evaporative cooling system), but these would need to be expanded to address this issue. Treatment risk mitigation actions identified including the development of new requirements to seek Green Star ratings to reduce exposure to this risk.

In addition to cost increases, it was also identified that some assets would be devalued if their carbon efficiency was not improved through the retrofit actions described above. This would have broader financial implications on Council's ability to raise capital.

UPark Adelaide

UPark Adelaide is an important Council revenue stream associated with the provision of carparks across the Council area for public use. A high materiality transition risk associated with UParks was the societal transition towards increased public transport usage leading to significant impacts on UPark revenues. In the extreme, these assets may become stranded assets. Suggested treatment actions included the development of regular strategic property reviews to reduce portfolio exposure and inform asset disposal or upgrades where required.

Waste services

Waste collection and management is an important aspect of the City of Adelaide's service delivery. Through the workshop the exposure of the waste sector to carbon pricing is a material risk to the City of Adelaide, given the likely cost implications on the waste sector. Further, initiatives to increase recycling across the state may also be a risk given the reliance on rate payment to achieve waste outcomes. A key risk treatment would be the increasing of rates to cover costs, which may lead to other reputational impacts for Council. In addition, the Strategic Waste Management Plan (currently in development) is an opportunity to strengthen internal operations and waste management programs, linking to Carbon Neutral Adelaide Actions 4.1.1, 4.1.3 and 4.4.1).

4.3.2 Opportunities

Fourteen transition opportunities were identified through the stakeholder workshop. These related to proactive responses to risks to create opportunities for innovation, improved service delivery and increased resilience of the Council to a shift towards a low-carbon economy.

The following priority opportunities were identified through the assessment:

- **Utilities and solar energy:** A key opportunity in relation to energy is the development of shared solar and demand management initiatives with Flow Power. Proactive development of community-led solar generation may increase the resilience of the City and residents to changes in carbon pricing and energy intensity.
- **Property portfolio:** A range of high priority opportunities for transition resilience across the City of Adelaide property portfolio were identified. These included:
 - The development and management of micro generation networks on council assets. This could represent a shift in Council's role to facilitate a more distributed energy model. This initiative also links with the Carbon Neutral Adelaide action 1.2.3 – to facilitate and case manage decentralised energy generation within significant development sites.
 - Installation and roll out of batteries for buildings to drive localised energy models. The current trial at London Road Depot represents a case study for this initiative, and Council should investigate opportunities to install energy storage systems when it is cost-effective to do so. Consideration should be given to the current retail electricity contract and the potential implications of electric vehicles as mobile batteries.
 - There are a range of opportunities to mitigate potential tenancy revenue risks through the provision of highly energy efficient tenancies that are attractive to changing market demand. Under a low-carbon future, it is anticipated that customers will seek increasingly sustainable tenancies to save costs and reduce organisational carbon emissions. This opportunity links with the Carbon Neutral Adelaide action 1.5.5 – to strengthen leasing policies to include consideration of leading industry standards such as Green Star Office Interiors; NABERS Office Water and Waste and emerging carbon neutral standards.
- **Climate leadership:** Given the City of Adelaide's current progress and goals towards zero carbon, there is a clear opportunity for the city to capitalise on this current progress to export sustainability knowledge and initiatives into the Australian marketplace. Several initiatives, including webinars and industry engagement sessions, have already made progress however further development to support a business-led climate network was identified. The demonstration of leadership towards the low-carbon transition was a key priority in this assessment. By becoming carbon ready, adapting early to key transition risks and achieving carbon neutrality goals, the City of Adelaide could further cement its reputation in this space. Future opportunities include the promotion of Adelaide as a zero-carbon destination for more sustainable local and interstate tourism.

5 Key findings

5.1 Climate change governance

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

5.2 Physical risk

The assessment identified 283 individual physical risks for the City of Adelaide based on independent assessment by the project team and review and refinement of the results by Council staff. Over three quarters of the risks identified in the assessment were associated with hot weather and rainfall, either the broader drying trend projected for Adelaide or the potential for more intense periods of rainfall leading to flooding.

Key risks related to the broad themes identified for this assessment by Council include the following:

- Key sites - The key sites that are considered to be at greatest risk are the Aquatic Centre, Community Centres, Rundle Mall and the Adelaide Central Market. None of these had extreme risks for 2030, but all had a combination of high and extreme risks by 2090.
- Crown land – While limited risks were identified, the major concern for Crown Land was the impact of drought and hot weather on the viability of green infrastructure into the future. This was rated as being at high risk even with adaptation measures taken into consideration.
- Buildings - Three risks to buildings were identified, however, none of these were evaluated as priority risks in this assessment. Risks to specific assets across the City of Adelaide are covered in the Key sites section.
- Parkland and open space assets - Several priority risks to these assets were identified, including the increased mortality of tree plantings on very hot days and resultant urban heat island implications, which was evaluated as an extreme risk for the far future.
- Infrastructure - One extreme risk was identified for the short term, related to the stormwater and drainage network. This category was associated with eight extreme risks in 2090. Roads were also associated with high risks at 2030 and 2090.
- Service - The services category had the highest number of individual risks across all groups, with 106 risks in total. High and extreme risks at 2030 and 2090 were common for cleansing (streets, toilets), events, community grants, homeless support, library services, horticulture, planning and building.

In summary, the risks common across all categories were:

- Impacts of heat on people and the ability to deliver Council services, the desire for people to come to the city, whether for shopping or events during periods of extreme heat, and the ability for residents and the homeless to access services.
- Impacts of heat and drier conditions on maintaining green infrastructure and trees, whether in parklands, open space areas, streetscapes, Crown Land or the golf links.
- Impact of the potential for increased rainfall intensity leading to greater localised flooding across the city, impacting buildings and service delivery.

As indicated in the governance assessment, it is important that risks are publicly disclosed in order to have effective climate change governance. The results of this risk assessment provide Council with the information need to update its corporate risk register, other corporate governance documents, and to produce a public facing summary of climate change risks.

It is common practice to ensure that extreme and high risks can have their residual risk rating reduced to moderate or lower once adaptation measures are implemented. Based on the adaptation measures identified during this risk assessment, this is possible for some but not all risks. Council needs to determine whether further identification of adaptation measures is required or whether it is willing to accept high risks in some instances.

The adaptation measures identified in this assessment should be used to develop an adaptation plan. There are two key factors to consider in this regard. First, is the "lifetime" of relevant decisions. This concept is explained in Stafford Smith et al. (2011), and suggests that for every decision there is a lead time and consequence time. Decisions with a long lifetime (e.g. over 50 years) such as building bridges, drainage and other infrastructure need to account for the long term effects of climate change in their design because even if this infrastructure is built now, it will need to continue to function under a different future climate in the latter part of the century. Second, is the timing of adaptation, noting that not all actions need to be implemented immediately, instead some adaptation measures can be implemented in the short term and others in the decades to come. This is the key underlying principle of an adaptation pathways approach.

Liability Risk

One of the five consequence areas considered in the physical risk assessment was "liability" risk. It is important to note that the risks identified as a "liability" risk in the risk assessment are general in nature. The risks have not been identified by a legal professional and are based on general liabilities that have been discussed in the literature, media and general conversations that the team had with Council staff and other local governments throughout Australia. In many cases the likelihood or consequence have not been determined as it has been deemed that further legal analysis is warranted. It should also be noted that it is reasonable to assume that any of the risks identified in the risk assessment that have a potential impact on health and safety have a heightened risk of legal risk (including risks of criminal charges).

As noted by Bell-James, Baker-Jones, & Barton (2017), when reviewing liability risks it is prudent to note that the relevant risks to local governments may materialise through the following areas:

- Administrative Law;
- Failure to adequately embed climate change into development plans;
- The release of hazard information (e.g. incorrect information);
- Not having adequate risk information; and
- Withholding hazard information.

Given the complex nature and broad range of potential legal risk associated with climate change it is difficult to assign likelihoods or possibilities as per a traditional risk management approach. Instead it is prudent that all risks and risk management options be assessed by in-house and/or independent legal professionals.

According to legal climate risk expert Mark Baker-Jones (Baker-Jones, 2014), councils are facing an increasing exposure to climate legal risk. Baker-Jones states that:

The primary concern for those charged with land use planning and development of infrastructure lies with decision making – how those assets are dealt with and how they are planned, managed and operated in light of the physical impacts. Local governments, and those involved in the development of long term infrastructure in particular, need to be able to make informed decisions about how to deal with the impacts of climate change if they are to avoid litigation.

Informed decision-making includes ensuring that governance mechanisms are designed to manage emerging risk, that risk assessments are updated on a regular basis and that councils ensure that decisions and advice come from suitably qualified people (council staff and external consultants).

As noted by Professor Justine Bell (Bell-James, 2017) councils should seek legal advice early for climate-related risks. She notes that nature of legal risk can be long-term. 'This means that councils should have a well-thought out policy that will help to back up their decisions and avoid ad hoc judgements. Ideally, any decisions will be backed by science and engineering.'

5.3 Transition risk

The transition risk assessment identified a range of important risks and opportunities related to a low-carbon economy transition. The assessment revealed a number of priority areas that should be brought into focus to increase the City of Adelaide's resilience to a range of climate futures as follows:

- Car parking - A high materiality transition risk associated with UParks was the societal transition towards increased public transport usage leading to significant impacts on UPark revenues. In the extreme, these assets may become stranded assets.
- Business model - Climate-related market changes in travel could drive the need for shifts in the city's revenue model. While this indirect risk is not within the City's direct control, there are opportunities for the city to support the diversification of less carbon intensive revenue generation in the region.
- The implications of carbon pricing - The effects of carbon pricing may have important implications across Council, from increasing the cost of waste services to changing tenant profiles at key sites. The City of Adelaide should build on current emissions reduction initiatives to focus on reducing exposure to these risks. Understanding carbon hotspots across organisational operations and the integration of carbon consideration into procurement processes allows for more targeted and effective emissions reductions initiatives that will be best place to respond to any introduction of carbon pricing. This would address exposure to reputational as well as financial risks. Importantly, carbon mitigation and risk management plans should be part of an integrated, cross Council response and not occur in isolation.
- Driving built environment resilience - Council's role in ensuring and facilitating compliance with the building code is a key opportunity to drive increased resilience, both physical and transitional, across the built environment. Council should ensure that the planning team are resourced and have the capacity to respond to and enforce increasingly stringent planning requirements to reduce Council's exposure to reputational and transition risk.
- Opportunities for climate leadership - The consideration of transition risk provides additional impetus to take bold and prudent action to reduce the social and economic implications of a low carbon transition. The City of Adelaide has already established itself as a leader through Carbon Neutral Adelaide's goals for carbon neutral operations. This assessment underscores these efforts and suggests that there are more opportunities to cement its position with broad benefit in reduced risk exposure as well as sharing knowledge across industries and geographies.

5.4 Next steps

This climate risk assessment presents one of the most comprehensive assessments of climate risk currently undertaken for a South Australian council. Despite the strong track record of the City of

Adelaide in responding to climate change, like most councils, significant work is still required to address current and emerging risks.

Priority next steps include the following actions:

- Prioritise climate change governance actions – The climate change governance assessment has identified what is required to increase or maintain each of the quantitative and qualitative governance scores. This information should be used to identify priority short term actions, which should include a focus on addressing those indicators for which there is currently no information or that received a low score i.e. public risk disclosure, emergency management and climate change policy.
- Public disclosure of risks – One of the gaps identified in the climate change governance assessment was the absence of a publicly available register or document of Council's physical and transition risks. The information contained in this report could be used to generate a public facing version of this assessment to increase awareness amongst external stakeholders and the broader of Council's current and emerging risks.
- Incorporate physical and transition risks into Council's risk register – There was limited understanding amongst staff as to the extent to which climate risk is considered in Council's corporate risk register. The results of this assessment can now be used to update the corporate risk register. This can in turn be used to help prioritise adaptation options for implementation.
- Develop an adaptation roadmap – This risk assessment identifies potential adaptation measures for a large number of risks, including those rated as medium to high. To guide implementation of these measures, and to communicate how Council is building resilience to climate change, an adaptation action plan could be developed. This would identify the highest priority adaptation measures and indicate how their implementation will be sequenced through time. This should include how adaptation will be addressed through future procurement decisions.
- Liability measures – A range of liability risks were identified during the assessment, however, in the absence of independent legal opinion the extent of the legal liability risk can not be quantified. It is recommended that Council consider obtaining legal advice regarding medium to extreme liability risks, especially in regard to the potential impacts from flooding.

References

- Baker-Jones, M. (2014). Litigation risk from climate change rising [online]. *Government News*, 34(3). Retrieved from <https://search-informit-com-au.ezp01.library.qut.edu.au/documentSummary;dn=563564032310124;res=IELBUS> ISSN: 1447-0500
- Bell-James, J. (2017). Seek advice early to reduce legal risk. *CoastAdapt feature*. Retrieved from <https://coastadapt.com.au/seek-advice-early-reduce-legal-risk>
- Bell-James, J., Baker-Jones, M., & Barton, E. (2017). Legal risk. A guide to legal decision making in the face of climate change for coastal decision makers. In *CoastAdapt Information Manual 6, 2nd edn*. National Climate Change Adaptation Research Facility, Gold Coast.
- Beyond Zero Emissions. (2010). *Australian Sustainable Energy Zero Carbon Australia Stationary Energy Plan*. Melbourne: University of Melbourne.
- CBA. (2019). *Commonwealth Bank of Australia Annual Report*. CBA.
- Clos, J. (2015). *From COP21 to the New Urban Agenda*. (U. Chronicle, Producer) Retrieved May 22, 2019, from <https://unchronicle.un.org/article/cop21-new-urban-agenda>
- Colonial First State. (2020, June). *Responsible Investment*. Retrieved from Colonial First State: <https://www3.colonialfirststate.com.au/about-us/corporate-profile/responsible-investment/climate-change.html>
- IEA. (2020, June). *World Energy Model - Scenario Analysis of Future Energy Needs*. Retrieved from International Energy Agency: <https://www.iea.org/reports/world-energy-model/sustainable-development-scenario>
- Meinshausen, M., Smith, S., & Calvin, K. (2011). The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. *Climatic Change*. Retrieved from <https://doi.org/10.1007/s10584-011-0156-z>
- Resilient East. (2016). *Resilient East Regional Climate Change Adaptation Plan 2016*. for the Eastern Region in association with the Government of South Australia and the Australian Government. Retrieved February 24, 2020, from https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/sector_agreements/sector-agreement-resilient-east-gen.pdf
- Stafford Smith, M., Horrocks, L., Harvey, A., & Hamilton, C. (2011). Rethinking adaptation for a 4 °C World. *Philosophical transactions. Philosophical Transactions of the Royal Society*, 396, 196 - 216. doi:doi:10.1098/rsta.2010.0277
- TCFD. (2016). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Retrieved March 22, 2018, from <http://www.fsb.org/wp-content/uploads/Recommendations-of-the-Task-Force-on-Climate-related-Financial-Disclosures.pdf>
- The City of Adelaide. (2016). *Strategic Plan 2016-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-strategic-plan-landscape.pdf?mtime=20190509094049>
- The City of Adelaide. (2019). *Integrated Business Plan 2019-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/plan-integrated-business-plan-2019-20.pdf?mtime=20190702122042>

Appendix A – Governance Assessment Report

See attached report

Appendix B – Council staff interviewed

The following table presents a list of council staff interviewed for the physical risk assessment.

Name	Position/Name	Relevant category
Alan Beaton	Manager (People Experience)	People and HR
Angela Paleologos	Group Team Leader (Cleansing)	Cleaning services
Anna Jordan	Manager (People Service)	People and HR
Anne Rundle	Manager (Culture and Lifelong Learning)	Library services
Belinda Dohring	Senior Consultant, Sustainability	Water Features
Ben Clark	Lead Consultant (Strategic Asset Management)	Footpaths
David Carroll	Manager (Service Delivery & Operations)	Information Management & IT
Dominic Fitzsimons	Team Leader - Golf Business Operations (Golf Links)	Golf links
Emina Allegretti	Project Officer, Community Resilience (City Wellbeing)	Community grants
Garry Herdegen	Associate Director, Public Realm - Workshop Services	Workshop services
Jean-Pierre Koekemoer	Associate Director (Infrastructure)	Stormwater and Drainage Network
Johanna Williams	General Manager (Rundle Mall Management Authority)	Rundle Mall
Kristen mackintosh	Manager (Building Assessment and Compliance)	Planning and building
Kym Charnstrom	Facilities Maintenance Officer (Facilities Management)	Structural
Lauren Schliebs	Group Team Leader - Operations (Aquatic Centre)	Aquatic centre
Liz Packer	Manager (Financial Accounting)	Finance
Matt Jorgensen	Team Leader Horticulture (Citywide)	Horticulture
Paul Addle	Manager (Strategic Property)	Land
Rebecca Rutschack	Manager (Planning Assessment)	Planning
Rod Case	Manager (Procurement and Contract Management)	Finance and Procurement
Sharon Prior	Team Leader (Off-Street Parking Services)	Parking
Stacey Bateson	Manager, Business Engagement	Customer Service
Steve/Stephen Zaluski	Manager (Customer Experience)	Permits and licences
Tanya Roe	Senior Consultant, Sustainability	Sustainability
Trent Snowball	Operations Manager (ACMA)	Adelaide Central Market
Vicki Thompson	Operations Coordinator Off-Street Parking	Uparks
Vitor Martins	Manager (Waste & Cleansing & Fleet)	Depot and workshops

Appendix C – Transition risk and opportunity workshop attendees

Name of participants	Role
Bec Taylor	Sustainability Coordinator
Belinda Dohring	Senior Consultant, Sustainability
Lara Daddow	Manager, Carbon Neutral Adelaide
Maria Zotti	Manager, Sustainability
Paul Smith	Senior Consultant, Sustainability
Tanya Roe	Senior Consultant, Sustainability
William Van Ausdal	Technical Specialist (Climate Change and GHG Inventories)

CLIMATE CHANGE ADAPTATION GOVERNANCE ASSESSMENT

Climate Change Adaptation Governance Assessment Report for the City of Adelaide



INFORMED.CITY™

Visualisation

Audit Committee Meeting - Minutes - 7 August 2020

Licensed by Copyright Agency. You must not copy this work without permission.



Prepared for:

The City of Adelaide

Date/ Version:

29 June 2020/ Version 4

Council documents downloaded on 24 February 2020

Prepared by:

Climate Planning and Edge Environment

Citation:

Climate Planning and Edge Environment 2020.
South Australia Climate Change Adaptation
Governance Assessment: Climate Change
Adaptation Governance Assessment Report for
the City of Adelaide, prepared for the City of
Adelaide, June 2020

Contact:

Donovan Burton
Climate Change Adaptation Specialist
Climate Planning
donovan@climateplanning.com.au

Dr Mark Siebentritt
Director
Edge Environment
mark.siebentritt@edgeenvironment.com

Caveat:

The information provided in the visualisations is the result of an analysis using Climate Planning's Informed.City™ tool, current as of 16th May 2020. This analysis has limitations based on the scope and resources allocated for this project, and therefore users should discuss these limitations with the authors before relying on the information. The method used to develop the visualisations and its results is copyright and cannot be used by any party without prior written permission from Climate Planning. The results cannot be relied upon by any third party and is not designed to (and therefore cannot be used to) support any legal, financial or insurance-based decisions without written approval from Climate Planning.

© Climate Planning 2020



Executive Summary

The City of Adelaide engaged Climate Planning and Edge Environment (Edge) to undertake an assessment of its climate change adaptation governance. This is one task under a broader climate risk assessment being delivered by Edge. This assessment indicates as to how well Council is incorporating climate change adaptation governance into their corporate processes and frameworks. The findings of this study include information collected from an online staff survey, results of the assessment of corporate documents, and findings from face-to-face meetings with representatives of the City of Adelaide. The report also provides a range of recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

Methodology

The Project Team used Climate Planning's Informed.City™ platform to implement the project. The governance assessment for the City of Adelaide was undertaken in two stages:

- **Quantitative Assessment** - typology-based review of local government inclusion and influence of climate change in publicly available corporate documents. Also included a survey of staff members' understanding of climate change impacts, their department's capacity to adapt and their perceived barriers and enablers to improved consideration of climate change in Council decision-making. The quantitative assessment was completed on the 24th of February 2020.
- **Qualitative Assessment** - qualitative analysis of local government consideration of climate change adaptation governance based on face-to-face meetings with key council staff members. These meetings were used to glean information about barriers and enablers to mainstreaming consideration of climate change. The qualitative assessment was conducted on the (19th and 20th February 2020).

Results and Specific Recommendations

The findings of this report bring together information obtained from the above two stages, with a summary of the key insights from the governance assessment presented below.

Quantitative assessment

The Project Team conducted a governance assessment of the City of Adelaide to explore how climate change was considered in their corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 1 displaying Council's performance.

Climate Change Adaptation Governance Assessment Report for the City of Adelaide



Figure 1: The City of Adelaide's quantitative scores for climate change adaptation governance

Table 1 provides the recommended 'first steps' which council should consider implementing for each indicator to improve their climate change adaptation governance scores.

Table 1: Recommended 'first steps' which the City of Adelaide should implement to improve their governance scores

Indicator Type Tag	Level	Recommendation
Strategic Planning (#1)	Intermediate	To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc.". Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaning information from other councils through peer-to-peer learning.
Financial Management (#2)	High	To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented. However, the effect of financial management issues on other council functions (e.g. assets) are important to consider. For example, understanding whether staff capacity, capability and training needs are a barrier to understanding climate change and its financial implications in your council.

Climate Change Adaptation Governance Assessment Report for the City of Adelaide

Indicator Type Tag	Level	Recommendation
Public Risk Disclosure (#3)	No data	No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.
Asset Management (#4)	Intermediate	To achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. An example of the text that would help improve consideration is: "Council recognises that climate change is likely to affect asset life and functionality. As such in future reports and analysis Council will explore how climate change will affect assets". The asset management plan should also specify a prescribed response to one of the climate change issues.
Land Use Planning (#5)	Intermediate	To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the Informed.City™ governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan.
Emergency Management (#6)	None	To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known disaster risks and affect those already especially vulnerable to natural hazards".
Greenhouse Gas Emissions Reduction (#7)	Advanced	Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.
Climate Risk Management (#8)	No data	No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Indicator Type Tag	Level	Recommendation
Adaptation Planning (#9)	High	This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders. There will be an initial outlay of resources required to achieve this level of adaptation planning (e.g. undertake climate change risk assessments, quantify the number of Council assets exposed to risk, cost and prioritise adaptation actions, and assign roles and responsibilities).
Climate Change Policy (#10)	None	A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an Informed.CityTM climate change adaptation governance assessment and have an advanced climate change policy.

Qualitative assessment

During the face-to-face meetings, the Project Team asked representatives of the City of Adelaide a series of questions about climate change. These questions were used in a qualitative analysis to understand the issues, barriers and enablers for considering climate change in decision making for the City of Adelaide. The results for the qualitative assessment are categorised into the seven indicators. From these results, the Project Team have devised the following specific recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

Indicator 11: Climate Risk Assessments

- 11.1 Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.
- 11.2 Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.

Indicator 12: Climate Legal Risk

- 12.1 Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.
- 12.2 Ensure that legal risks associated with climate change are included in the risk register, until well managed.

Indicator 13: Staff Capacity and Resource Allocation

- 13.1 Review opportunities to embed capacity building into existing staff training, such as new employee inductions.
- 13.2 Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.

Indicator 14: Community/ Stakeholder Engagement

- 14.1 Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.

Indicator 15: Institutional/ Intergovernmental Relationships

- 15.1 Seek to clarify the role of Council as compared with the State Government about managing climate risk.
- 15.2 Work with banks to better understand how they are considering the effects of climate change. It would be in the City's interest to identify how they identify risk and what they see determines resilience at a City level. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.

Indicator 16: Climate Change Information

- 16.1 Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.

Indicator 17: Information Systems

- 17.1 Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.
- 17.2 Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.
- 17.3 Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.

Conclusion

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction

indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

Table of Contents

Executive Summary	i
List of Figures	viii
List of Tables	ix
List of Abbreviations	x
1 Introduction	1
1.1 Responding to Climate Change	1
1.2 A South Australian Context	1
1.3 Assessing Climate Change Adaptation Governance	2
2 About This Report.....	3
3 Methodology.....	3
3.1 Quantitative Assessment	3
3.1.1 Keyword Analysis	5
3.1.2 Evaluation Matrices.....	5
3.2 Qualitative Assessment.....	6
4 Results and Specific Recommendations	7
4.1 Results for Staff Governance Survey	7
4.2 Results and Recommendations for Quantitative Assessment	9
4.2.1 Overview of Quantitative Assessment Results.....	9
4.2.2 Indicator 1: Strategic Planning.....	10
4.2.3 Indicator 2: Financial Management.....	12
4.2.4 Indicator 3: Public Risk Disclosure.....	15
4.2.5 Indicator 4: Asset Management	17
4.2.6 Indicator 5: Land Use Planning	19
4.2.7 Indicator 6: Emergency Management.....	21
4.2.8 Indicator 7: Greenhouse Gas Emissions Reduction	23
4.2.9 Indicator 8: Climate Risk Management.....	24
4.2.10 Indicator 9: Adaptation Planning.....	26
4.2.11 Indicator 10: Climate Change Policy	29
4.3 Results and Recommendations for Qualitative Assessment.....	31
4.3.1 Indicator 11: Climate Risk Assessments	31

4.3.2	<i>Indicator 12: Climate Legal Risk</i>	33
4.3.3	<i>Indicator 13: Staff Capacity and Resource Allocation</i>	34
4.3.4	<i>Indicator 14: Community/ Stakeholder Engagement</i>	35
4.3.5	<i>Indicator 15: Institutional/ Intergovernmental Relationships</i>	36
4.3.6	<i>Indicator 16: Climate Change Information</i>	37
4.3.7	<i>Indicator 17: Information Systems</i>	39
5	Conclusions	40
6	References	42
7	Appendices	44
	<i>Appendix A: Questionnaire from staff governance survey</i>	44
	<i>Appendix B: List of keywords used for quantitative assessment</i>	50
	<i>Appendix C: Questions used in the qualitative governance assessment</i>	50
	<i>Appendix D: Key terminology used in the quantitative assessment</i>	53

List of Figures

Figure 1: The City of Adelaide's quantitative scores for climate change adaptation governance	ii
Figure 2: Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016)	2
Figure 3: Number of the City of Adelaide staff members from each department who participated in the staff governance survey	8
Figure 4: The City of Adelaide's quantitative scores for climate change adaptation governance	9
Figure 5: Impact of climate change on the City of Adelaide's operations and procedures	11
Figure 6: Enablers contributing to the City of Adelaide's ability to plan for climate change	13
Figure 7: The City of Adelaide's level of preparedness for responding to climate change impacts ...	21
Figure 8: Barriers hindering the City of Adelaide's ability to plan for climate change	25
Figure 9: Use of climate change risk assessments in the City of Adelaide departments	32
Figure 10: Information sources commonly used by the City of Adelaide staff members to understand climate change impacts	38

List of Tables

Table 1: Recommended 'first steps' which the City of Adelaide should implement to improve their governance scores	ii
Table 2: Justification of climate change adaptation governance indicators for the quantitative assessment	4
Table 3: The City of Adelaide's corporate documents identified for the quantitative assessment	5
Table 4: Justification of climate change adaptation governance indicators for qualitative assessment	6
Table 5: Understanding of climate change impacts and adaptation for the City of Adelaide staff members.....	8
Table 6: The City of Adelaide's quantitative evaluation for climate change adaptation governance	10
Table 7: The City of Adelaide's indicator score for Strategic Planning	11
Table 8: The City of Adelaide's indicator score for Financial Management.....	14
Table 9: The City of Adelaide's indicator score for Public Risk Disclosure.....	16
Table 10: The City of Adelaide's indicator score for Asset Management	18
Table 11: The City of Adelaide's indicator score for Land Use Planning	20
Table 12: The City of Adelaide's indicator score for Emergency Management	22
Table 13: The City of Adelaide's indicator score for Greenhouse Gas Emissions Reduction	24
Table 14: The City of Adelaide's indicator score for Climate Risk Management.....	26
Table 15: The City of Adelaide's indicator score for Adaptation Planning.....	28
Table 16: The City of Adelaide's indicator score for Climate Change Policy.....	30
Table 17: Types of information which would help the City of Adelaide staff members incorporate climate change into job.....	38

List of Abbreviations

ASIC	Australian Securities and Investments Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWMS	Community Wastewater Management System
FTE	full-time equivalent
ICT	information communication technology
IPCC	Intergovernmental Panel on Climate Change
KPI	Key performance indicator
NCCARF	National Climate Change Adaptation Research Facility
QLD	Queensland
SEMP	State Emergency Management Plan
SMP	strategic management plans
TAS	Tasmania
TCFD	Task Force on Climate-related Financial Disclosures
UNFCCC	United Nations Framework Convention on Climate Change
WSUD	water-sensitive urban design
ZEMC	Zone Emergency Management Committees
ZEMP	Zone Emergency Management Plan

1 Introduction

1.1 Responding to Climate Change

Climate change is a pressing issue for local government that is already manifesting as a legal, social, economic and environmental risk. Local governments make decisions that span generations (e.g. roll-out of infrastructure, planning for future settlements) and as such need to be actively assessing and responding to the direct and indirect risks that climate change presents. However, since climate change presents a plethora of direct and indirect challenges that are likely to change over time, it will be impossible to effectively manage the issue in an ad-hoc and reactive manner.

Climate change requires a focus on both mitigation and adaptation activities. Mitigation limits the long-term contribution of greenhouse gas emissions to global environmental change and adaptation responds to the impacts that will already be locked into the climate system. The integration of mitigation and adaptation activities act as drivers for a low carbon economy, accessing economic and social opportunities.

Robust decision-making frameworks minimise future uncertainty as issues and information emerge and become important. This has been identified as the priority for Australian local governments:

Local governments will better respond to the challenges of climate change in an environment where adaptive responsibilities are clear, response and evaluation frameworks are consistent across jurisdictions, approaches to mainstreaming climate change adaptation are implemented, and decisions are made on the basis of the best data and information. (National Climate Change Adaptation Research Facility (NCCARF), 2013)

1.2 A South Australian Context

South Australia was the first jurisdiction in Australia to introduce climate change-specific legislation – the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act). The Act promotes climate change mitigation and adaptation action within South Australia that provides consistency with national and international schemes. In response to the Act, the Local Government Climate Change Adaptation Program was developed with the support of the Local Government Association Mutual Liability Scheme. This led to the first comprehensive assessment of climate risks across councils in South Australia, which were mostly undertaken over the period 2010 to 2011.

This initial experience with climate risk planning was built on following the release in 2012 of South Australia's adaptation framework "Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia". The framework outlined a consistent approach for the development of regional adaptation plans and delivery of integrated vulnerability assessments for all parts of the State. The resulting integrated vulnerability assessments and regional plans were completed over the period 2014 to 2017 and have been progressively implemented in most regions with the support of region-wide or council specific adaptation action plans.

1.3 Assessing Climate Change Adaptation Governance

The extent to which climate change risk and adaptation is considered in a local government's core governance documents may affect the implementation of the organisation's approach to climate change adaptation.

Measuring and monitoring indicators for climate change adaptation and mitigation governance provide a platform for a consistent approach. This allows local governments the ability to monitor and improve their performance over time. Initial focus and emphasis should be on a council's adaptation governance. Unless it can be ensured that a council's internal adaptive capacity is robust, that is its ability to respond to potential climate change impacts, then there is a risk that specific adaptation actions will be ad-hoc and constrained by limited resourcing and political support.

[Climate change] governance is not about the specific measure but the system and framework that supports the decision-making process...given the complexities and rapid emergence of regulations, evolving information and market responses, implementing [climate change] governance is the only way an organisation can truly maintain an effective response (Edwards, Burton, & Baker-Jones, 2017).

Understanding climate change governance may help decision-makers to estimate the vulnerability of a system to stress and address the underlying causes of vulnerability over time. It may help to support proactive decision-making by assisting organisations to identify both the risks and possible responses in advance and develop the capacity to implement the required actions.

The need to focus on climate change governance is gaining momentum in academic literature, United Nations publications and approaches, and corporate disclosure frameworks (Clos, 2015). For example, disclosure of governance arrangements around climate-related risks and opportunities is a key component of the recommendations of the Financial Stability Board's [Task Force on Climate-related Financial Disclosures](#) (TCFD) (see Figure 2).



Figure 2: Core Elements of Recommended Climate-Related Financial Disclosures (TCFD, 2016)

2 About This Report

This report presents the methodology and results of an analysis of the extent of climate change adaptation governance for the City of Adelaide. It includes the information collected from an online staff survey, results of the governance assessment, and findings from face-to-face meetings with representatives of the City of Adelaide. The report also provides a range of recommendations to assist the City of Adelaide in improving their climate change adaptation governance.

This assessment predominantly focuses on adaptation governance. Mitigation has been considered only regarding formal greenhouse gas emissions reduction targets. A detailed greenhouse gas emissions governance assessment requires an audit of baseline emissions data and data recording protocols (e.g. emissions scope, alignment to Australian standards etc.) – which is outside the scope of this project.

3 Methodology











This project uses Climate Planning's climate change adaptation governance assessment framework to understand how effectively climate change considerations are integrated into the corporate operations and governance for the City of Adelaide. The governance assessment was undertaken in two stages:

- **Quantitative Assessment** - typology-based review of local government inclusion and influence of climate change in publicly available corporate documents. Also includes a survey of staff members' understanding of climate change impacts, their department's capacity to adapt and their perceived barriers and enablers to improved consideration of climate change in Council decision-making.
- **Qualitative Assessment** - qualitative analysis of local government consideration of climate change adaptation governance based on face-to-face meetings with key council staff members. These meetings were used to glean information about barriers and enablers to mainstreaming consideration of climate change.

3.1 Quantitative Assessment

The quantitative assessment aimed to identify publicly available corporate documents for the City of Adelaide and undertake a deeper exploration into how climate change is considered in those governance documents. These corporate documents are the key governance documents that either drive the organisational decision-making or report on the effectiveness of those processes. The documents were assessed against ten quantitative indicators for climate change adaptation governance (see Table 2).

Table 2: Justification of climate change adaptation governance indicators for the quantitative assessment

Indicator	Justification
 Strategic Planning	Strategic Planning documents direct how decision-makers in local government must discharge their responsibility under State legislation. Including considerations of climate change here will likely result in better likelihood for mainstreaming the issue in the council's operations and financial structures.
 Financial Management	If ignored, the effects of climate change are likely to have a considerable impact on a council's financial performance. This includes costs associated with asset management, service delivery, legal risk and insurance. Climate change may also affect rateable property value and therefore have the potential to affect council's primary income stream.
 Public Risk Disclosure	There is an increasing demand in the private sector for a transparent approach to addressing climate-related risk. A transparent approach means public disclosure of risks. Over time councils can expect insurers and finance providers, amongst others, to request councils to disclose how they are addressing climate-related risk.
 Asset Management	Local governments have hundreds of millions (and in some cases billions) of dollars invested in assets. Some of the assets that councils maintain have a long life expectancy and as such may be exposed to direct and indirect climate change risks. This generates a potentially unexplored or under-quantified financial risk for local governments.
 Land Use Planning	Land use planning can play a critical role in climate change adaptation. Strategic and local planning decisions can both increase or decrease the exposure of human settlements to climate change impacts. If done well effective land use planning can support climate-resilient and low energy development.
 Emergency Management	There are significant opportunities to drive climate change adaptation decision making through emergency management planning. Adaptation has numerous supporting benefits for emergency management including the implementation of risk planning for disaster mitigation and preparedness, response capacity and minimising exposure to reoccurring situations.
 Greenhouse Gas Emissions Reduction	Climate change mitigation actions allow for an exploration and promotion of resilient energy systems and passive solar design that may reduce human health-related issues as well as considerable energy savings. Furthermore, it is very likely that climate change adaptation will need to occur in a carbon-constrained economy.
 Climate Risk Management	Climate change is a complex issue that will exacerbate existing risks and present new ones. Often climate change risk management is undertaken in an ad hoc way – resulting in inconsistent approaches within an organisation. Some direction that defines how climate change risk is identified and disclosed will greatly improve council's adaptation planning.
 Adaptation Planning	Best practice adaptation plans identify the actions required to mitigate specific risks and have mechanisms in place to respond to physical, transitional and liability risks. Adaptation planning helps to set key performance indicators and establish roles and responsibilities across council and more broadly.
 Climate Change Policy	An internal Climate Change Policy (or corporate standard/ statement of intent) allows the organisation to place a climate change lens over all of council's activities and use the existing system to drive adaptation, risk minimisation and transition to a lower-carbon economy. It can allow for the agreed use of information sources and specific triggers for change.

The quantitative assessment focusses specifically on an assessment of Council's corporate document which are publicly available which means they are accessible through an online platform (e.g. Council's website). An analysis of only public documents supports the growing recognition that disclosure of climate risk is an important element in climate change management. This is reinforced by Edwards et al. (2017) who state that "it is not enough to do the right thing, one must also be seen to be doing the right thing." The Paris Agreement recognises transparency as a fundamental principle in climate change management (both in actions and in governance). There is also an increasing call for local government disclosure of risk and governance responses by those who re-

insure local government risk. Proactive disclosure aids market decisions and also increases public trust in the government (Kim & Kim, 2007).

3.1.1 Keyword Analysis

The Project Team has identified 13 publicly available corporate documents from the City of Adelaide which align with the ten quantitative indicators of climate change adaptation governance (see Table 3). The team conducted a keyword analysis to identify how many words associated with climate change were present in Council's documents. Some of the words reviewed include 'climate change', 'adaptation' and 'greenhouse gas emissions' (a complete list of words can be found in Appendix A). If any of these words were identified, the Project Team undertook a closer analysis of the context to assess the extent of how they were considered in the documents.

Table 3: The City of Adelaide's corporate documents identified for the quantitative assessment

Indicator	Document Name
Strategic Planning (#1)	▪ Strategic Plan 2016-2020
Financial Management (#2)	▪ Integrated Business Plan 2019-2020
Public Risk Disclosure (#3)	
Asset Management (#4)	<ul style="list-style-type: none"> ▪ Building Asset Management Plan 2016 ▪ Infrastructure Asset Management Policy 2020 ▪ Park Lands Open Space Asset Management Plan 2016 ▪ Transportation Asset Management Plan 2017 ▪ Urban Elements Asset Management Plan 2016 ▪ Water Infrastructure Asset Management Plan 2016
Land Use Planning (#5)	<ul style="list-style-type: none"> ▪ Development Plan 2020 ▪ Adelaide Design Manual 2016
Emergency Management (#6)	▪ Eastern Adelaide Zone Emergency Management Plan 2018
Greenhouse Gas Emissions Reduction (#7)	▪ Carbon Neutral Strategy 2015-2025
Climate Risk Management (#8)	
Adaptation Planning (#9)	▪ Resilient East Regional Climate Change Adaptation Plan 2016
Climate Change Policy (#10)	

3.1.2 Evaluation Matrices

The Project Team assessed the corporate documents for each governance indicator using a scoring system developed by Climate Planning. The method is relatively simple as it uses scaled matrices with descriptions on a continuum between no consideration and an advanced consideration of climate change. The Project Team scored the corporate documents using a five-point scale which was tailored to each governance indicator in the quantitative assessment (these evaluation matrices are provided in Section 4.2).

Since the quantitative assessment relies on an analysis of the corporate documents, Council staff were not directly engaged for the quantitative indicators. Although, some findings obtained from the face-to-face meetings may inform and/ or provide context about some of the quantitative indicators and will, therefore, be presented in the results where relevant. However, they are not








given any weight in the conclusions of this report (other than limitations/ barriers to mainstreaming noted by the staff).

The findings in this report are based on a quantitative assessment of the City of Adelaide that was completed on the 24th of February 2020.

3.2 Qualitative Assessment

The purpose of the qualitative assessment was to build a more complete representation of climate change adaptation by focussing on the complex drivers which could not be understood through an assessment of public corporate documents in the quantitative assessment. These drivers are captured in seven qualitative governance indicators (see Table 4).

Table 4: Justification of climate change adaptation governance indicators for qualitative assessment

Indicator	Justification
 Climate Risk Assessments	Climate change risk assessments are useful for identifying and quantifying the potential effects of climate change. They provide organisations with the critical information they need to understand the impacts that climate change may present. Risk assessments also help to identify and prioritise issues that require further investigation and/ or adaptation actions.
 Climate Legal Risk	Climate change is emerging more and more as a climate legal risk problem that governments, organisations and the community are attempting to understand, avoid and manage. The nature of climate legal risk for local governments is a minefield that can manifest itself in many ways. There is the potential that one lawsuit could erode a council's financial resilience.
 Staff Capacity and Resource Allocation	Monitoring councils' resource and staffing commitment to climate change is critical to supporting ongoing climate change adaptation. If a council only relies on external consultants for adaptation research and responses, then it is doing very little to support the improved internal adaptive capacity of its organisation. The overarching goal for adaptation should be to mainstream consideration of climate change across all council activities.
 Community/ Stakeholder Engagement	Connecting to the community is a core component for developing a safer, more resilient community. It is a local community who will bear the brunt of climate change impacts as they directly or indirectly contribute towards adaptation efforts (e.g. through increased insurance costs, taxes, and voluntary community actions).
 Institutional/ Intergovernmental Relationships	Climate change is a trans-boundary issue. Adaptation action (or inaction) by one stakeholder can both improve and erode the resilience of another. Economies of scale and collectively sharing knowledge can improve adaptation governance. The actions by a range of organisations have the potential to affect councils' resilience.
 Climate Change Information	Understanding the impacts of climate change requires access to climate change information. Whilst institutions such as NCCARF, CSIRO, and universities freely provide valuable publications on climate change risk and adaptation, obtaining climate change projections (e.g. from climate change models) is often a time consuming and expensive task, or one that can misalign with councils' timing needs.
 Information Systems	As the information technology age continues to shape our society it comes as no surprise to see that information services are playing an increasing role in supporting council operations and providing a new interface with the community it serves. Information communication technology networks such as social media platforms, websites and information portals have the potential to contribute significantly to councils' climate change adaptation ambitions.

The Project Team undertook face-to-face meetings with representatives from the City of Adelaide. During the meeting conversations, representatives were asked a series of questions which the Project Team later used in a qualitative analysis to understand the issues and barriers and enablers for considering climate change in decision making for the City of Adelaide. The information was obtained through a set of consistent questions aligned to the relevant themes. The series of core questions are provided at the end of this report (see Appendix B).

The results collected through the qualitative assessment are not directly attributed to a 'score'. The findings from this assessment are used to build a better understanding of some areas of these indicators that may not become evident through a reading of the documents in isolation. While findings will not be attributed to a score, the outcome will inform any discussion or recommendations. They will also be recorded for comparative review of future assessments.

The face-to-face meetings for Council were conducted on the 19th and 20th February 2020.

4 Results and Specific Recommendations

The results focus on interesting findings of the governance assessment as well as possible links drawn from a survey of staff members. This section first provides an overview of the results for the staff governance survey. It then addresses the results and specific recommendations for the quantitative and qualitative assessment separately. Any interesting findings from the face-to-face meetings or the staff governance survey which relate to a specific governance indicator have also been integrated into the results.

4.1 Results for Staff Governance Survey

Of the 254 staff members in the City of Adelaide who participated in the staff governance survey, the highest representation work in the Customer Service department (38 staff members, 15%). This is closely followed by the Water and Waste department which had 27 staff members (11%) participate in the online survey (see Figure 3).

It is important to note that 254 respondents are considered a high response rate for an individual council's survey response. Such a large sample size provides Council with more information about their staff members understanding about climate change impacts and provides more reliable results. The City of Adelaide should be commended for their participation efforts for this survey.

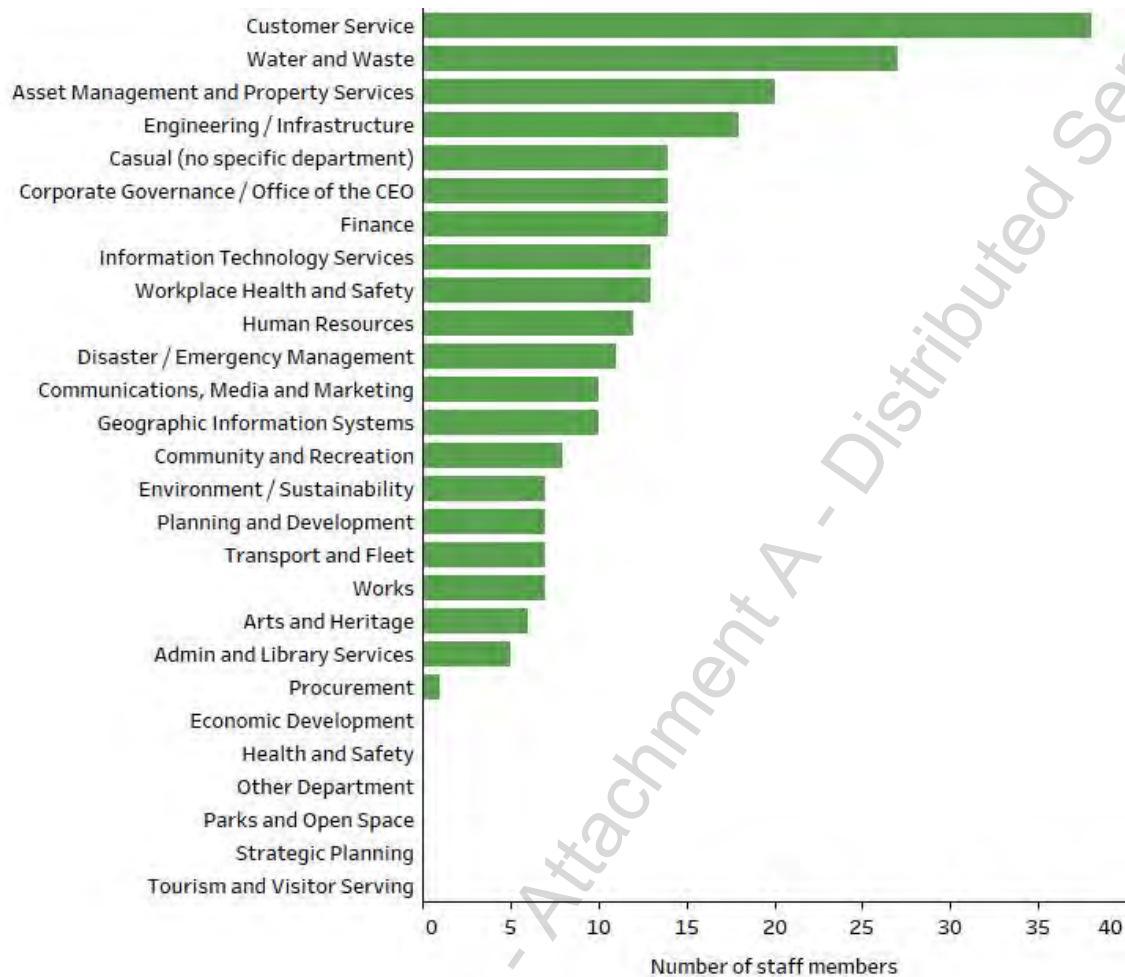


Figure 3: Number of the City of Adelaide staff members from each department who participated in the staff governance survey

The online survey found that 86% of respondents have some level of understanding of climate change impacts and adaptation. There were 123 staff members who stated that their understanding is limited, and 93 staff members who believed that they could comfortably incorporate/ consider climate change in their job (see Table 5). Furthermore, 144 respondents (64%) identified a good understanding of climate change as an enabler to Council's ability to plan for climate change.

Table 5: Understanding of climate change impacts and adaptation for the City of Adelaide staff members

	Number of staff members	% of staff members
I am not sure of my understanding	26	10%
I have no understanding	8	3%
My understanding is limited	123	49%
I could comfortably incorporate/ consider climate change adaptation	93	37%
Total	250	100%

4.2 Results and Recommendations for Quantitative Assessment

The specific results of the quantitative assessment have been divided into the ten quantitative indicators of climate change adaptation governance. This section will elaborate on the City of Adelaide's results for each governance indicator and provide specific recommendations for how council can transition to a higher score level. The analysis of each indicator will discuss the importance of the indicator, staff survey results, quantitative assessment results, and specific recommendations. Findings from the face-to face meetings will be provided for relevant indicators.

Please note that only one recommendation has been provided for each indicator as a 'first step' for council to transition to the next score level. These recommendations are specific to each level which means that completing one recommendation will only improve Council's score by one level. For this reason, there may be a range of recommendations which Council can implement to achieve a desired indicator score. For example, there are three specific recommendations which a council can implement to transition from 'Intermediate' to 'Advanced' for a particular indicator.

4.2.1 Overview of Quantitative Assessment Results

The Project Team conducted a governance assessment of the City of Adelaide to explore how climate change was considered in their corporate documents. The City of Adelaide was assessed against ten quantitative governance indicators, with Figure 4 displaying Council's performance.

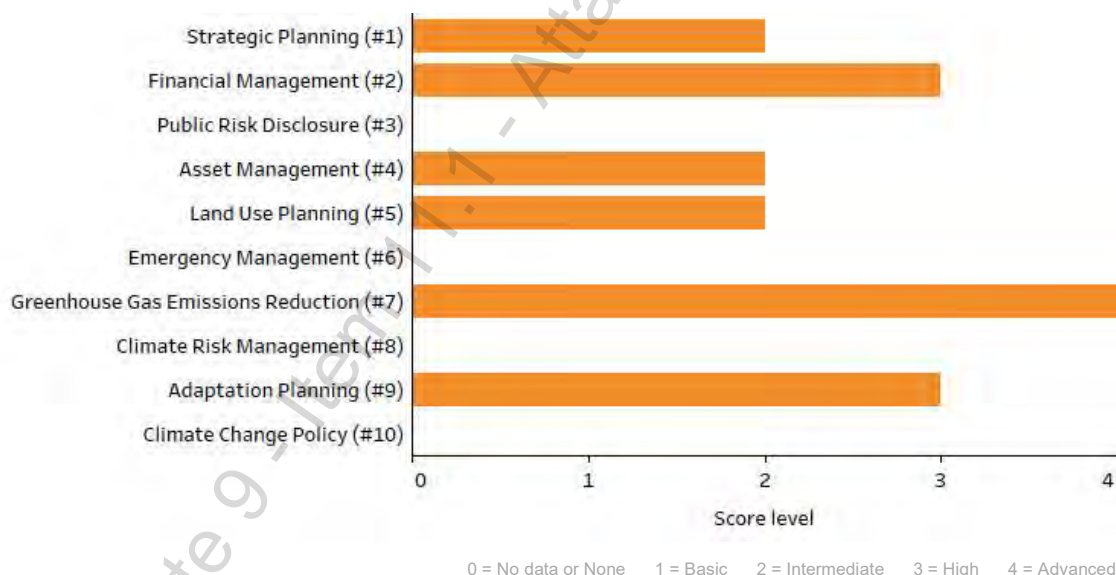


Figure 4: The City of Adelaide's quantitative scores for climate change adaptation governance

The evaluation matrix (see Table 6) provides a summary of the City of Adelaide's for each governance indicator including descriptions to explain how the indicators were assessed.

Table 6: The City of Adelaide's quantitative evaluation for climate change adaptation governance

Indicator	Level	Description
Strategic Planning (#1)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Financial Management (#2)	High	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Public Risk Disclosure (#3)	No data	No publicly available risk register OR risk disclosure documents were found.
Asset Management (#4)	Intermediate	Prescribed responses/ guidance for one climate change issue (e.g. bushfire) AND/OR one council function (e.g. land use planning) only.
Land Use Planning (#5)	Intermediate	Brief inclusion of climate change for one or more climate change issue AND/OR planning theme. Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
Emergency Management (#6)	None	No consideration of climate change (or associated keywords) in the emergency management plan/s.
Greenhouse Gas Emissions Reduction (#7)	Advanced	Climate change target and aim for carbon neutrality by or before 2050.
Climate Risk Management (#8)	No data	No publicly available risk management documents were found.
Adaptation Planning (#9)	High	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Climate Change Policy (#10)	None	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.

4.2.2 Indicator 1: Strategic Planning

Justification for this indicator

The strategic management plans (SMPs) are local government's core guiding documents that combine the community's aspirational vision, together with Council's commitments to actions to achieve these goals. Under Section 122 (1) of the *Local Government Act 1999*, "A council must develop and adopt plans (which may take various forms) for the management of its area, to be called collectively the strategic management plans" (Government of South Australia, 2019). These plans aim to identify the council's objectives for the area over a period of at least 4 years.

SMPs establish the vision, goals and objectives for a local government, as well as help shaped formal management processes. There is no prescribed format for Council SMPs and as such the information contained in them varies from council to council. Given the influence of the SMP, any consideration of climate change in the document/s is likely to assist local government adaptation decision-making.

Staff survey results

The online survey showed that 166 staff members (68%) believe that climate change is impacting Council's operations and procedures now and around 15% of respondents (36 staff members) believe it will be felt within the next 15 years (see Figure 5).

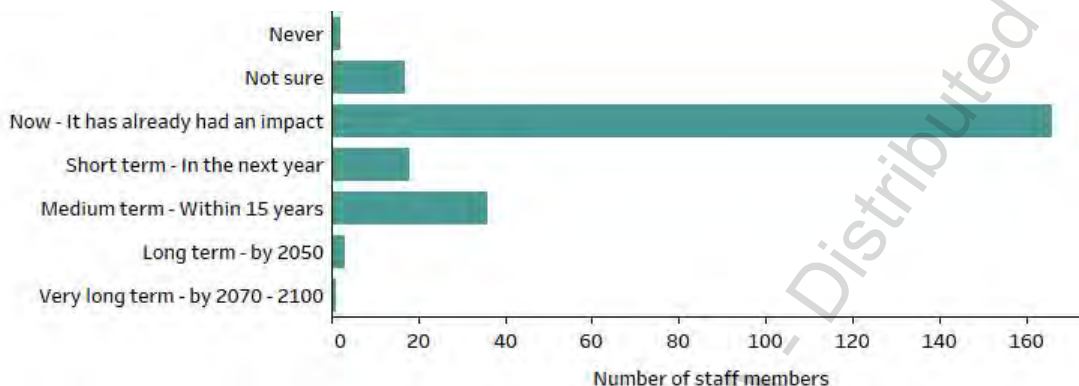


Figure 5: Impact of climate change on the City of Adelaide's operations and procedures

Quantitative assessment results

The Project Team reviewed the Strategic Plan 2016-2020 for this indicator. The plan provides objectives to assist Council in becoming a carbon neutral city with a specific focus in on reducing greenhouse gas emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Strategic Planning indicator (see Table 7).

Table 7: The City of Adelaide's indicator score for Strategic Planning

Level (Score)	Indicator Description
No data	No publicly available Strategic Management Plan/s were found.
None (0)	No consideration of climate change (or associated keywords) in the Strategic Management Plan/s.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of prescribed responses, climate change issues, council functions, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Strategic Planning indicator:

To increase the score for this indicator (to 'High') the next revision of the Strategic Management Plan requires some examples of specific climate change actions spanning more than one council department. General phrases that will support a 'High' score include: "Council will explore how climate change adaptation and mitigation can be mainstreamed into decision making. Specifically, Council will be focusing on heatwave or bushfire risk etc.". Some resources should be allocated to staff capacity (e.g. conferences and training) as well as some specific technical support which may be required for some elements. However, the majority of support able to be gained from State Government guidelines and information reports as well as gleaning information from other councils through peer-to-peer learning.

Findings from the face-to-face meetings

There was high awareness that the City of Adelaide's Strategic Plan considers climate change. However, participants suggested that an even clearer strategic direction is warranted that applies to specific functions such as assets and services across Council. It was noted that if it were improved it would help further mainstream the consideration of climate change into the organisation.

4.2.3 Indicator 2: Financial Management

Justification for this indicator

Climate change is increasingly seen as a financial management issue. The cost of direct and indirect impacts will cascade through the economy and affect costs associated with a local government's activities and responsibilities. For example, at a local level, changes in the productivity of the wine sector could impact wine and tourism businesses, while homes at risk from flood and fire could lead to reduced property values in some areas. At an international level, increased extreme weather in Asia may disrupt global supply chains and affect the availability of certain goods and services for local governments, or increased litigation may affect local government insurance costs (general insurance and liability cover). The *Local Government Act 1999* requires local governments to prepare a Long-Term Financial Management Plan (s.122)(1a) and an Annual Business Plan (s. 123)(1) as part their system of financial management.

Furthermore, climate change adaptation requires initial and ongoing outlay of resources and commitment of staff time. Resource constraints and/or lack of financial commitment from local governments are often identified as a primary barrier to implementing climate change adaptation. In Climate Planning's experience, it involves minimal resourcing for a council to achieve a 'Basic' or 'Intermediate' score for Financial Management, however, to reach the upper score ranges ('High' and 'Advanced') requires a more formal and strategic commitment.

Staff survey results

In the online survey, 114 staff members (49%) identified limited assigned funding as a barrier hindering Council's ability to plan for climate change, which ranked first in the collection of barriers. On the other hand, 62% of respondents (139 staff members) acknowledged that an understanding the costs/ benefits of climate change adaptation actions is an enabler for climate change. This was a popular enabler among staff members, with it ranked second in the list of enablers (see Figure 6). Other enablers identified were external funding (64 staff members, 28%) and avoiding future unbudgeted costs (61 staff members, 27%).

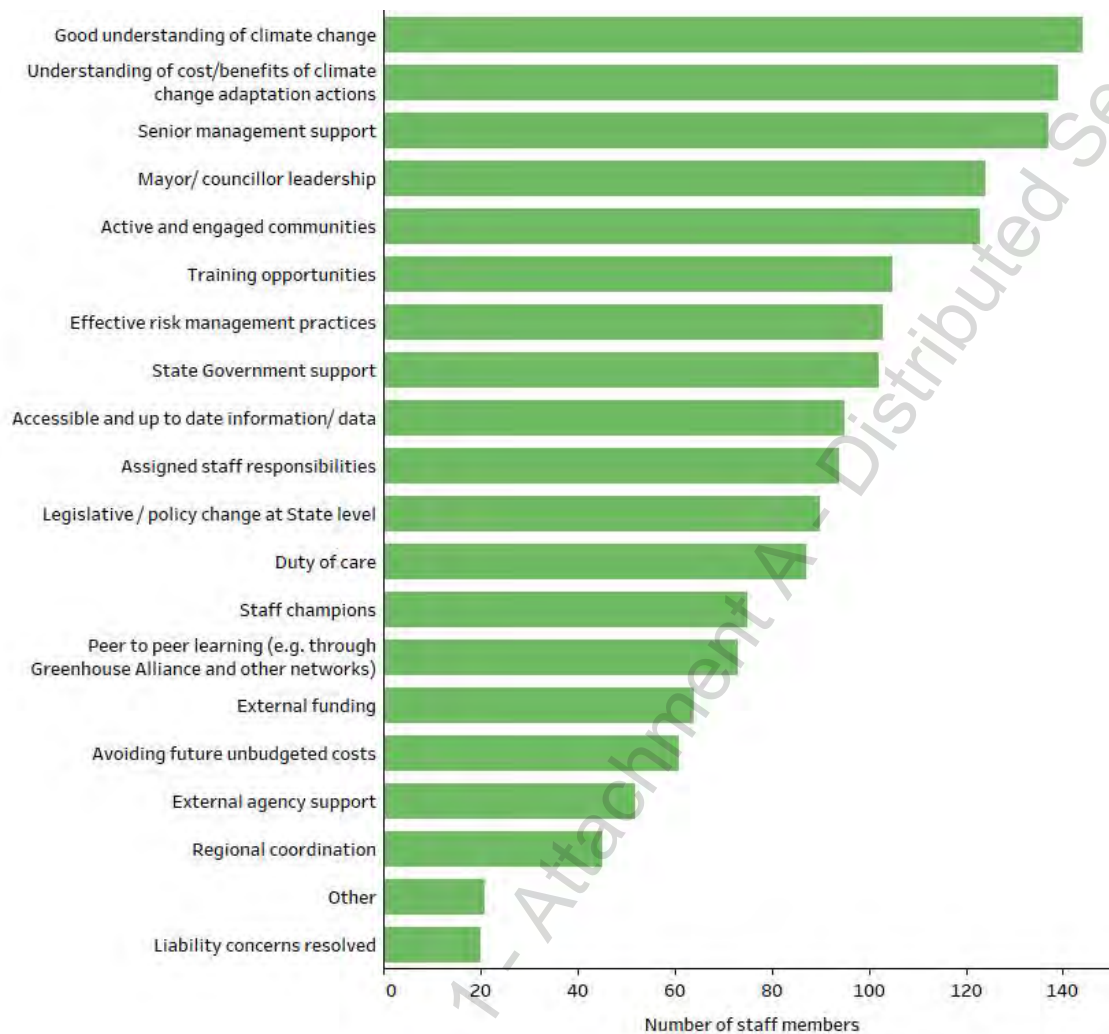


Figure 6: Enablers contributing to the City of Adelaide's ability to plan for climate change

Quantitative assessment results

The Project Team assessed the Integrated Business Plan 2019-2020 for this indicator. The plan considers climate change, specifically for the Climate Change Action Initiatives Fund. Through this fund Council seeks to:

... invest in strategic incentive programs such as \$1.6 million for the climate change initiatives including the sustainability incentives scheme, sustainability performance improvement programs, low and zero emission vehicles, Carbon Neutral Adelaide Partners Program and Building Upgrade Finance. (The City of Adelaide, 2019)

Since the initiative aims to deliver a range of projects, programs and incentives, this sees the City of Adelaide score 'High' for the Financial Management indicator (see Table 8).

Table 8: The City of Adelaide's indicator score for Financial Management

Level (Score)	Indicator Description
No data	No publicly available financial management documents ¹ were found.
None (0)	No consideration of climate change (or associated words) in the financial management documents ¹ .
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Climate change adaptation is recognised in financial planning (more than one climate change issue AND/OR council function). But the financial management documents do not guide innovative finance or investment policies.
Advanced (4)	Climate change adaptation is well-budgeted for and resources allocated for mainstreaming. Consideration for climate change in investments and/or investment policies etc. is stated. Innovated finance mechanisms may also be encouraged.

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues and council functions

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'High' to 'Advanced' in the Financial Management indicator:

To increase the score for this indicator (to 'Advanced') requires some specific focus on the potential supporting policies (e.g. asset management, climate change policy). Council should make statements in its financial planning documents about divestment from fossil fuels, energy transition, and consideration of a price on carbon in adaptation decisions. Council should also consider issues such as insurance, effects on rateable value, asset OPEX and CAPEX issues and other direct and indirect issues associated with climate change. Financial management should also state how financial performance while responding to climate change will be implemented. However, the effect of financial management issues on other council functions (e.g. assets) are important to consider. For example, understanding whether staff capacity, capability and training needs are a barrier to understanding climate change and its financial implications in your council.

Findings from the face-to-face meetings

In the meetings, some financial-related issues were highlighted demonstrating widespread awareness of the potential financial implications of climate change. These included:

- Heatwave risk presents many financial challenges to Council and general local economy. For example, Council has evidence which shows hotter days can result in up to a 19% reduction in retail activity in the CBD and there are reports of a 30% decline in foot traffic in the CBD during the heatwave in the lead up to Christmas 2019. The financial ramifications for Council may include increased pressure to undertake unplanned capital expenditure to cool Rundle Mall. Without this expenditure, there may also be financial exposure due to businesses moving to a different location (affecting rateable income and/or rental income streams).

- It was noted by the staff interviewed that there is a direct link between extremely hot days and workplace productivity – especially related to outdoor staff. As temperatures increase there is a reduced opportunity for staff to work outdoors due to health and safety concerns. It was noted by one workshop participant that the financial ramification of a heatwave could be as much as \$10,000 per hour in lost productivity.
- Several staff members recognised that when access to the Torrens River water supply is constrained it results in an increase in water costs for Council (approximately \$1,500 per day).
- Bushfire and flood events result in increased clean-up costs. If climate change is likely to affect flooding and bushfire risk then there is likely to be an increased budget allocation for post-event clean-up costs (as it is not likely that Council would opt to reduce the service and not clean up after an event).
- Extreme events were noted to have a material effect on some of Council's business units. For example, an extremely hot day may see a decrease in car parking revenue and an increase in the casual visitation numbers at the aquatic centre (e.g. December 2019 numbers saw a 10% increase).
- It was noted during the meetings that if infrastructure and assets are less able to meet required service levels, or have a reduction in working life, then this could devalue the asset base for Council. This could in turn impact on Council's ability to raise capital.

Additional Recommendations Associated with Financial Management

- Consider developing an internal climate change fund to respond to climate-related risks (e.g. like the City of Onkaparinga Climate Resilient Fund)
- Plan and budget for passive cooling designs for Rundle Mall as an area that shoppers can go to during a heatwave.
- Establish a system (e.g. job code/s) that enables quantification of climate-related risks and risk management activities.
- Ensure climate change is embedded into the processes of the Strategic Risk and Internal Audit Group
- Review accountancy standards and Australian Securities and Investments Commission (ASIC) guidelines for climate-related financial risk management and reporting (e.g. AASB/IASB practice standards).

4.2.4 Indicator 3: Public Risk Disclosure

Justification for this indicator

There is considerable evidence to suggest that climate change will have a material impact on a local government's operations and as such, it would be prudent to assess the consideration of climate change in Council's public risk registers. Currently, there is no regulatory requirement to maintain a public risk register however the *Local Government Act 1999* requires councils to manage their risks. However, Section 48 (aa1) of the *Local Government Act 1999* requires each Council to have

prudential management “policies, practices and procedures” that must be applied to all Council projects, not just large ones (Government of South Australia, 2019).

There is increasing pressure for organisations to disclose their climate change related risks (e.g. Carbon Disclosure Project programs – which encourage organisations to publicly disclose climate risks). Over time councils can expect insurers and finance providers, amongst others, to request councils to disclose how they are addressing climate-related risk. Furthermore, the Paris Agreement (which Australia is a signatory to) maintains a strong focus on transparency and disclosure.

This level of transparency helps to inform businesses and the community about the emerging risks and control measures that a council is implementing (or intends to implement). Council should seek advice on which elements of climate change risk can be effectively disclosed.

Quantitative assessment results

The City of Adelaide’s website was searched for a strategic risk register, however, no publicly available risk register was found. The Project Team reviewed all corporate documents from the other governance indicators however were unable to find any risk disclosure information. As a result, the City of Adelaide scored ‘No data’ for the Public Risk Disclosure indicator (see Table 9).

Table 9: The City of Adelaide’s indicator score for Public Risk Disclosure

Level (Score)	Indicator Description
No data	No publicly available risk register OR risk disclosure documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the public available risk register OR risk disclosure documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one climate change risk ¹ (e.g. infrastructure risk) only.
High (3)	Detailed inclusion of climate change (more than one climate change issue AND/OR climate change risk), but is limited to responses to direct impacts ¹ of climate change.
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, climate change risks, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from ‘No data’ to ‘None’ in the Public Risk Disclosure indicator:

No information was available to assess this score. Risk management is often a contentious issue and not having publicly available documents may result in community dissatisfaction (and result in political instability). Ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Findings from the face-to-face meetings

Council staff indicated that the management of the corporate risk register was compliant with legislation but that it was not available to the general public. It was also noted that climate change was not captured adequately in the risk register. In fact, some staff noted that the poor consideration of climate change in the corporate risk register was one of the drivers for this assessment.

4.2.5 Indicator 4: Asset Management

Justification for this indicator

Local governments have hundreds of millions (and in some cases billions) of dollars invested in assets. Some of the assets that councils maintain, or are likely to install and maintain, have a long life expectancy and as such may be exposed to direct and indirect climate change risks. A failure of asset management consideration generates a potentially unexplored or under-quantified financial risk for local governments. The *Local Government Act 1999* requires local governments to prepare an Infrastructure and Asset Management Plan (s.122)(1a).

In 2013, the Australian Standards released the voluntary standard AS5334-2013 Climate Change Adaptation Standard for Settlements and Infrastructure – a Risk-Based Approach. The fact that this standard has recently been developed signals that organisations are anticipating compliance requirements. Over time government agencies that provide infrastructure funding or co-funding to councils will likely require climate change to be considered in the delivery of projects. How a local government manages assets under climate change will be a key determinant in understanding a settlement's limits to adaptation.

Quantitative assessment results

The Project Team assessed the following six asset management documents for this indicator:

- Building Asset Management Plan 2016
- Infrastructure Asset Management Policy 2020
- Park Lands Open Space Asset Management Plan 2016
- Transportation Asset Management Plan 2017
- Urban Elements Asset Management Plan 2016
- Water Infrastructure Asset Management Plan 2016

All of Council's asset management plans consider climate change, with an emphasis on how these Asset Management Plans address Council's strategic planning actions to reduce carbon emissions. For this reason, the City of Adelaide scored 'Intermediate' for the Asset Management indicator (see Table 10).

Table 10: The City of Adelaide's indicator score for Asset Management

Level (Score)	Indicator Description
No data	No publicly available asset management documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the asset management documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
High (3)	Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
Advanced (4)	Climate change is well-considered and includes responses to direct and indirect impacts ¹ .

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, council functions, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Asset Management indicator:

To achieve an improvement in this governance score (to 'High') Council should include climate change in the introduction of the asset management planning documents and/or policies as well as give some specific reference to at least two known risks or assets that may be exposed to the effects of climate change. An example of the text that would help improve consideration is: "Council recognises that climate change is likely to affect asset life and functionality. As such in future reports and analysis Council will explore how climate change will affect assets". The asset management plan should also specify a prescribed response to one of the climate change issues.

Findings from the face-to-face meetings

During the face-to-face meetings, staff members recognised that the asset management plans were key documents in ensuring that Council was effectively understanding and managing its climate risks. However, some of the workshop participants suggested that currently, the consideration of climate change into asset management was ad-hoc. They also noted that some of the Asset Management Plans were currently being reviewed, which provided an opportunity to have better consideration of climate change.

Specific examples of the impacts of climate change on the operation and maintenance of assets were:

- the implications of increasing impervious cover which when combined with greater rainfall intensity will lead to greater flood risk;
- the potential for drainage infrastructure to become overwhelmed with projections of increasing rainfall intensity in the future, leading to greater flood risk such as in the south-eastern corner of the CBD;

- greater demand for water-sensitive urban design (WSUD) features which could help to manage flood risk and also improved urban greening outcomes, such as have already been demonstrated in streets in the south-western part of the CBD; and
- the impact of warmer and drier conditions on trees and green space, which is relevant to the Park Lands Open Space Asset Management Plan.

It was noted that while there was broad awareness of the potential impacts of climate change on assets, it was necessary to obtain more evidence on performance under different conditions.

4.2.6 Indicator 5: Land Use Planning

Justification for this indicator

Land use planning can play a critical role in climate change adaptation. Strategic and local planning decisions can increase or decrease the exposure of human settlements to climate change impacts. Climate change is a risk multiplier for local government. The primary risk extends well beyond just sea level rise (which is conventionally exclusively considered) and can include increased riverine and urban flood risk, increased heatwaves, increased bushfire risks and the potential for increased intensity of extreme storm events to name a few. These risks can be minimised by effective land use planning.

Under South Australian legislation, “a development plan is a statutory policy document which guides the type of development that can occur within a council area” (Government of South Australia, 2018). Part 4 (s.9) of the *Planning Development and Infrastructure Act 2016* states that:

Until 1 July 2020, a Development Plan under the repealed Act (as in force at a relevant time) will have effect for the purposes of this Act as if it formed part of the Planning and Design Code (subject to the operation of this clause). (Government of South Australia)

Whilst councils’ influence on a development plan may be constrained by overarching South Australian policies and/or legislation there is still a broad array of responses that local government can implement to manage the challenges associated with climate change.

Staff survey results

In the online survey, 135 staff members (61%) believe that statutory planning support is very helpful in adapting to climate change impacts.

Quantitative assessment results

The Project Team assessed two documents for this indicator, they were Council’s Development Plan 2020 and the Adelaide Design Manual 2016. The review did not find keywords related to climate change in Development Plan. However, the Adelaide Design Manual specifically identifies the importance of street trees and plants in “preparing for the future challenges of climate change and creating a more climate resilient city” (City of Adelaide, 2016). The manual was included in this assessment as it provides strategic and technical guidance for the design and management of public spaces in the City of Adelaide. This sees the City of Adelaide score ‘Intermediate’ for the Land Use Planning indicator (see Table 11).

Table 11: The City of Adelaide's indicator score for Land Use Planning

Level (Score)	Indicator Description
No data	No publicly available Development Plan was found.
None (0)	No consideration of climate change (or associated keywords) in the Development Plan.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Brief inclusion of climate change for one or more climate change issue ¹ AND/OR planning theme ¹ . Also includes objectives or desired outcomes for specific climate change considerations. May have some general strategies or suggested responses.
High (3)	Detailed inclusion of climate change for one or more climate change issue AND/OR planning theme (including detailed strategies or suggested responses). May need updating to reflect the most recent IPCC assessment report from the date of publication. May have also considered other planning instruments (e.g. guidelines).
Advanced (4)	A significant consideration is given to climate change. Importantly, the Development Plan also includes responses to indirect impacts ¹ of climate change. Must also reflect the latest science - most recent IPCC assessment report from the date of publication.

¹ See Appendix C for definitions of prescribed responses, climate change issues, planning theme, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Intermediate' to 'High' in the Land Use Planning indicator:

To increase the score for this indicator (to 'High') Council should have a detailed consideration of climate change in the Development Plan. A detailed consideration of climate change would be one that considers multiple physical climate change risks, preferably with a good consideration in the general provisions. The most suitable action is for Council to glean information from a Council with similar geography or population which has scored a minimum of 'Intermediate' in the Informed.City™ governance analysis. Council may be constrained by State policies and legislation to implement the above. If that is the case, then Council should lobby the State to enable it to have greater flexibility to incorporate climate change into its Development Plan

Findings from the face-to-face meetings

Staff noted that land use planning was a stronger driver for minimising risk – however, there was a recognition that the Government of South Australian has most of the control over how land use plans are shaped. As such it was likely that the City's role for land use planning may be better suited as one of advocacy.

Key land use planning issues identified by staff were the continued growth in high-density developments in the CBD and changing demand for transport options. These were seen as presenting both opportunities and challenges for reducing emissions (e.g. transition to new modes of transport) and managing climate risk (e.g. buildings designed to be resilient to a different future climate).

4.2.7 Indicator 6: Emergency Management

Justification for this indicator

There are some important opportunities to drive climate change adaptation decision making through local government emergency management planning. Adapting to the effects of climate change has numerous supporting benefits for emergency management including the implementation of risk planning for disaster mitigation and preparedness, building appropriate response capacity and minimising exposure to reoccurring situations. Consideration of the long-term trends of climate change is fundamental for assessing risks, while still maintaining the ability to respond to unanticipated events and ensuring that emergency management is approached from a planning and mitigation perspective rather than purely as a responsive entity.

Under Section 9 (1e) of the *Emergency Management Act 2004*, the State Emergency Management Plan (SEMP) establishes eleven Zone Emergency Management Committees (ZEMCs) which are responsible for ensuring effective emergency risk management at the zone level. A key role of the ZEMCs is to develop a Zone Emergency Management Plan (ZEMP) to address residual risk and evaluate treatment options (Government of South Australia, 2016). As well as having a ZEMP some councils also have local emergency management plans or business interruption plans. To achieve the 'Advanced' score in this assessment, a council must have a local emergency management plan (or similar) that comprehensively considers climate change.

Staff survey results

The online survey revealed that 86 staff members (35%) believe that the City of Adelaide is 'prepared' for responding to climate change impacts which is slightly more than the 76 staff members (31%) who believe that Council is not prepared (see Figure 7). Interestingly, there are another 68 staff members (28%) who were unsure of Council's level of preparedness for climate change. It should also be noted that no staff members from the Disaster/ Emergency Management department participated in the online survey.

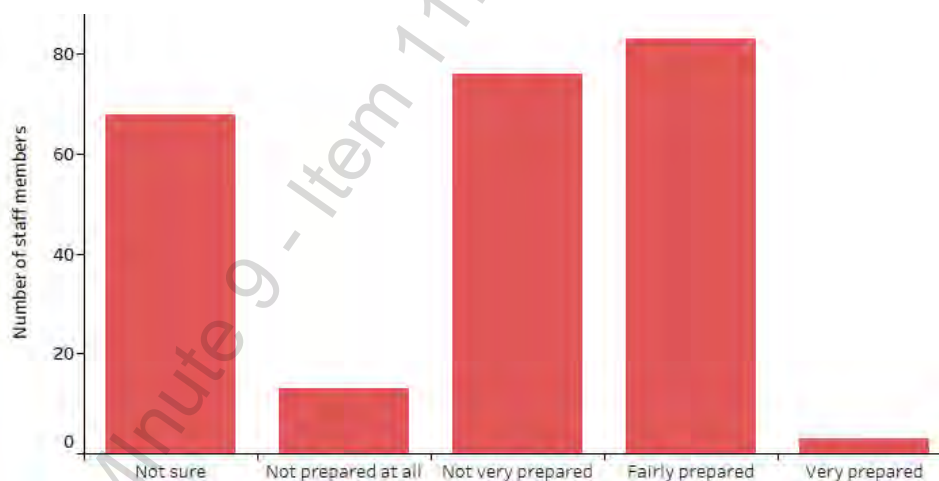


Figure 7: The City of Adelaide's level of preparedness for responding to climate change impacts

Quantitative assessment results

The Project Team assessed only the Eastern Adelaide Zone Emergency Management Plan 2018 for this indicator as a publicly available council emergency management plan was not found for the City of Adelaide. Since no consideration of climate change (or associated keywords) was found in the plan, the City of Adelaide scored 'None' for the Emergency Management indicator (see Table 12).

Table 12: The City of Adelaide's indicator score for Emergency Management

Level (Score)	Indicator Description
No data	No publicly available emergency management plan/s was found.
None (0)	No consideration of climate change (or associated keywords) in the emergency management plan/s*.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Considers climate change issues ¹ in at least one element of emergency management (e.g. plan for increased heatwaves) in either a council or regional emergency management plan.
High (3)	Considers climate change issues in two or more elements of emergency management (e.g. plan for increased heatwaves) in a council emergency management plan.
Advanced (4)	A council emergency management plan exists and considers climate change issues in all elements of emergency management (e.g. provides climate scenarios, links to international and national leading standards, includes other council climate studies etc).

¹ See Appendix C for definitions of climate change issues

* If a regional document is searched then a localised adjustment is applied for coastal hazards. This may mean that a coastal council may score differently to an inland council for the same regional plan.

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'Basic' to 'Intermediate' in the Emergency Management indicator:

To increase the score for this indicator (to 'Basic') the Council Emergency Management Plan (or similar instrument) must be amended to ensure that, at a minimum, climate change is referred to in the introduction. An example of phrases in a Council Emergency Management Plan that will support a 'Basic' score includes: "Climate change is likely to exacerbate many of the known disaster risks and affect those already especially vulnerable to natural hazards".

Findings from the face-to-face meetings

Although participants generally demonstrated a strong general knowledge of potential physical climate risks such as extreme heat and flooding, and fire in regional areas surrounding Metropolitan Adelaide, face-to-face meetings identified few emergency management processes or plans that were directly considering climate change. Nevertheless, it was noted that Council has established a volunteer group of leaders who are participating in a ten-week training to help deliver the messaging of emergency management under a changing climate.

Specific observations from meetings included that:

- there is awareness that bushfires in the regions surrounding Adelaide can have a direct impact on the City, including by impacting the number of workers coming into the CBD and the number of people visiting shops and restaurants;
- the requirement for emergency services for people experiencing heat stress, such as in exposed areas like Rundle Mall, may increase under projected changes in extreme heat; and
- there is a risk assessment process but there is limited understanding of how climate-related risks relevant to emergency services feed into the risk register.

4.2.8 Indicator 7: Greenhouse Gas Emissions Reduction

Justification for this indicator

Climate change mitigation actions are listed as a core governance process for adaptation, as they allow for an exploration and promotion of resilient energy systems and passive solar design that may reduce human health-related issues (e.g. heat stress), as well as considerable energy savings. Furthermore, it is likely that all climate change adaptation will need to occur in a carbon-constrained economy.

Understanding the nexus between the two is an important element of adaptation. Many infrastructure-based adaptation actions (e.g. sea walls) are carbon-intensive and as such local governments will need to consider this in any cost-benefit analysis.

Quantitative assessment results

The Project Team searched for a climate change target in Council's greenhouse gas emissions documents, other core governance documents identified in the quantitative assessment, and on Council's website. The assessment found a consideration to reduce greenhouse gas emissions in the Carbon Neutral Strategy 2015-2025 which establishes Council's aspiration to be a carbon neutral city. The strategy sets two emissions reduction targets:

1. "The City of Adelaide has reduced its carbon emissions by 35% by 2020 (from the 2006–07 baseline year).
2. The City of Adelaide has zero net carbon emissions by 2025." (The City of Adelaide, 2015)

These targets are reflected in Council's Strategic Plan and Asset Management Plans. These results see the City of Adelaide score 'Advanced' for the Greenhouse Gas Emissions Reduction indicator (see Table 13).

Table 13: The City of Adelaide's indicator score for Greenhouse Gas Emissions Reduction

Level (Score)	Indicator Description
None (0)	No publicly available greenhouse gas emissions documents were found. Also, climate change target or consideration to reduce greenhouse gas emissions was not found in any of the core governance documents OR displayed on Council's website.
Basic (1)	A commitment or consideration to reduce greenhouse gas emissions is generally mentioned (either in greenhouse gas emissions documents, other core governance documents OR displayed on Council's website). Climate change target established to 2020* only.
Intermediate (2)	Climate change target established to 2030 (or one other single date) but minimal information on existing greenhouse gas emissions. No target for carbon neutrality.
High (3)	Climate change target established out 2050 but no target for carbon neutrality. Information on Council's current/ historical greenhouse gas emissions is provided.
Advanced (4)	Climate change target and aim for carbon neutrality by or before 2050.

* If in a future assessment the year 2020 has past, then the emissions reduction target MUST be established to 2025

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to maintain an 'Advanced' in the Greenhouse Gas Emissions Reduction indicator:

Council has received an 'Advanced' score for this indicator. Achieving this score sees Council in the top fraction of Australian local governments for this indicator and places it in a position to share its journey with other local governments seeking to improve their consideration of climate change. To ensure that this indicator maintains this level it will be important to monitor any new national and international targets (e.g. bringing forward carbon neutrality date). It will also be important to ensure that Council maintains sufficient staff capacity and resources to maintain their score for this indicator.

Findings from the face-to-face meetings

There was extensive knowledge of Carbon Neutral Adelaide across the different functions of Council. Staff noted that Council had a progressive emissions reduction target and were likely to be better at mainstreaming mitigation than adaptation.

4.2.9 Indicator 8: Climate Risk Management

Justification for this indicator

The Climate Risk Management indicator assesses the extent to which climate change is embedded into Council's traditional risk management policies or strategies. While complementary, it is different from the information captured in Indicator 3: Public Risk Disclosure by taking a more high-level approach to risk management.

Climate change is a complex issue that will exacerbate existing risks and present new ones. Some direction that mandates how climate change risk is identified and disclosed will greatly improve Council's adaptation planning. If a local government does not know what is at risk and the consequences of those risks, then they are unlikely to implement adaptation actions.

Staff survey results

In the online survey, 107 staff members (46%) believe that misunderstood risks are barriers to Council's ability to plan for climate change, which ranked second in the collection of barriers. Nevertheless, 46% of respondents (103 staff members) recognised that effective risk management practices would better enable the City of Adelaide to plan for climate change.

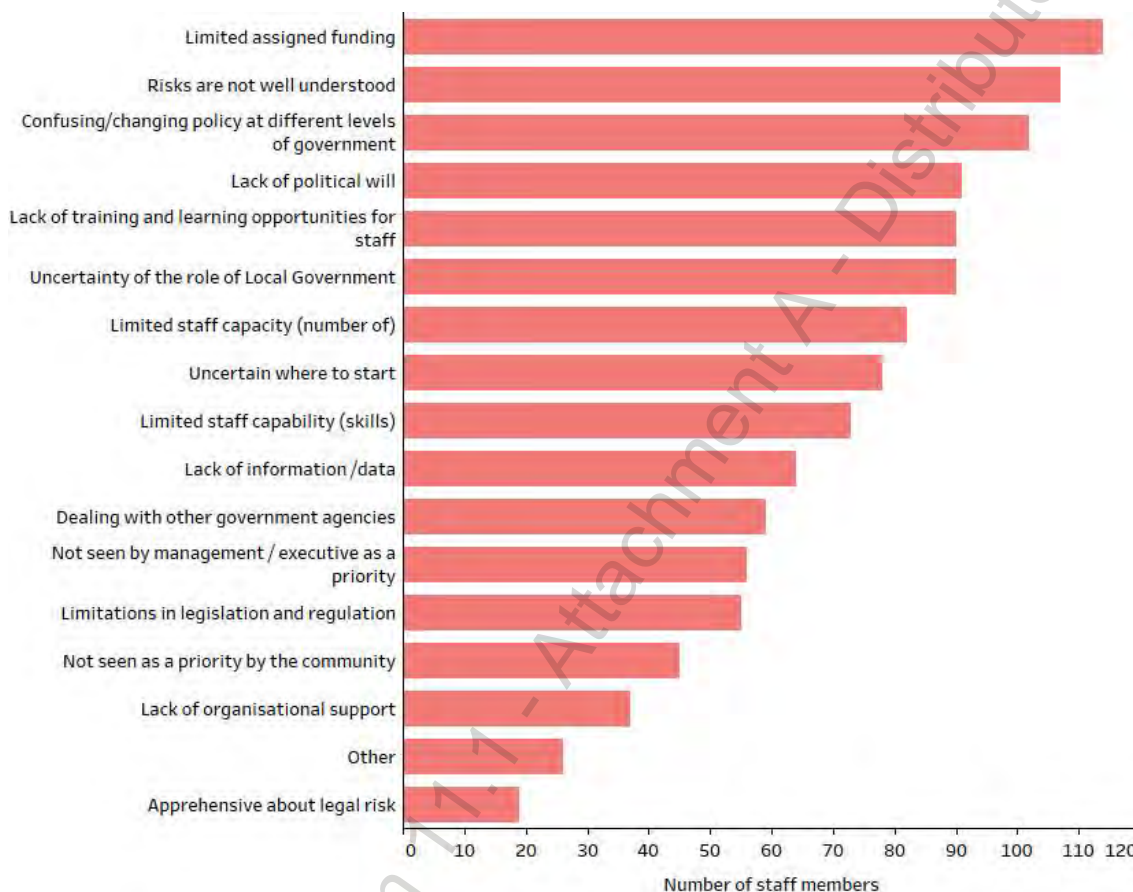


Figure 8: Barriers hindering the City of Adelaide's ability to plan for climate change

Quantitative assessment results

The City of Adelaide's website was searched for a risk management policy, strategy and/or plan. Since no publicly available risk management documents were found, the City of Adelaide scored 'No data' for the Climate Risk Management indicator (see Table 14).

Table 14: The City of Adelaide's indicator score for Climate Risk Management

Level (Score)	Indicator Description
No data	No publicly available risk management documents ¹ were found.
None (0)	No consideration of climate change (or associated keywords) in the risk management documents.
Basic (1)	General statements about climate change (e.g. in the introduction) OR includes other keywords associated with managing climate change in a general context (e.g. greenhouse gas emissions).
Intermediate (2)	Prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one climate change risk ¹ (e.g. infrastructure risk) only.
High (3)	Detailed inclusion of climate change (more than one climate change issue AND/OR climate change risk), but is limited to responses to direct impacts ¹ of climate change.
Advanced (4)	Climate change issues AND/OR climate change risks should be considered in all risk decision-making. Must include responses to indirect impacts ¹ of climate change.

¹ See Appendix C for definitions of documents, prescribed responses, climate change issues, climate change risks, and direct and indirect impacts

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'No data' to 'None' in the Climate Risk Management indicator:

No information was available to assess this score. Council should ensure that the relevant reports associated with this indicator are publicly available. Transparency supports community confidence in Council and enables businesses and residents to ascertain the extent of Council decision-making associated with this climate change.

Findings from the face-to-face meetings

Climate risks to assets, services and Council operations were discussed in almost all meetings. While general awareness was high about the potential for risks to arise, it was recognised that there is no standard Council-wide approach to climate risk management or for integrating climate risks across Council into the corporate risk register.

The staff interviewed were commonly of the view that Council needed to improve the consideration of climate change in its risk management system, although some teams reported that they had identified climate change as an issue to address in their area of responsibility. It was noted by some that a climate change policy may help guide strengthening of how climate risk management occurs within Council.

4.2.10 Indicator 9: Adaptation Planning

Justification for this indicator

A Climate Change Adaptation Plan helps council implement a staged process for adapting to climate change. Good practice adaptation plans also identify the actions required for specific risks

and has mechanisms in place to respond to direct and indirect climate change risks. In particular, good practice adaptation planning helps to:

- clarify roles and responsibilities,
- identify prioritised activities and focus areas,
- allocate resourcing,
- identify triggers for action or change/review,
- establish monitoring and evaluation mechanisms, and
- effectively manage any maladaptation risks.

South Australia's Strategic Plan (recently repealed) specified "the development of regional climate change adaptation plans in all State Government regions by 2016" (Government of South Australia, 2012). This was supported by South Australia's adaptation framework, 'Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia' which:

recognises that climate change and its economic, social and environmental impacts will vary across South Australia and therefore provides for the development of locally relevant adaptation responses across the 12 existing State Government regions. (Government of South Australia, 2012)

Staff survey results

In the online survey, 47 staff members acknowledged having training for climate change adaptation (21% of respondents surveyed). There was some diversity in where staff members received their adaptation training, with it being from other training (19), and a university or TAFE subject (15), a consultant (12), peak body training package (12), and a university degree in climate change adaptation (9).

Quantitative assessment results

The Project Team assessed only the Resilient East Regional Climate Change Adaptation Plan 2016 for this indicator as a publicly available council adaptation plan was not found for the City of Adelaide. This plan is Council's regional climate change adaptation plan which aims to provide a coordinated and collaborative response to climate change across the Eastern Region. The plan achieves these goals by identifying priority adaptation actions which will respond to the challenges and opportunities presented by a changing climate (Resilient East, 2016). This sees the City of Adelaide achieve a 'High' for the Adaptation Planning indicator (see Table 15).

Table 15: The City of Adelaide's indicator score for Adaptation Planning

Level (Score)	Indicator Description
None (0)	No publicly available climate change adaptation strategy and/or action plan* (or similar council-wide strategy/ action plan that drives adaptation planning) were found.
Basic (1)	Focussed on one specific climate change issue ¹ AND/OR one council function ¹ with only summary statements for adaptation provided (not the whole of Council).
Intermediate (2)	Summary statements for more than one climate change issue AND/OR council function provided but only for Council activities (not community). Time frames for adaptation actions also allocated.
High (3)	Detailed responses for adaptation actions for both the Council and community. Does not have all the attributes listed in the 'Advanced' score level.
Advanced (4)	A council adaptation strategy and/or action plan exists. It must include ALL of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders.

¹ See Appendix C for definitions of climate change issues and council functions

* If a regional document is searched then a localised adjustment is applied for coastal hazards. This may mean that a coastal council may score differently to an inland council for the same regional plan.

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'High' to 'Advanced' in the Adaptation Planning indicator:

This recommendation focusses the need for on a Council climate change adaptation strategy (or similar) as a local instrument (not just regional). A detailed local plan ensures ownership and can better align with internal governance and reporting. Ensure that a comprehensive Council adaptation strategy and/or action plan exists (for Council and the community). As a minimum include all of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), includes information from the community, and other key stakeholders. There will be an initial outlay of resources required to achieve this level of adaptation planning (e.g. undertake climate change risk assessments, quantify the number of Council assets exposed to risk, cost and prioritise adaptation actions, and assign roles and responsibilities).

Findings from the face-to-face meetings

There was a low to moderate level of awareness of the existence of the Resilient East Climate Change Adaptation Plan and the general content contained in that Plan with respect to physical risks for the Council and potential impacts. It was not clear from meetings how the actions from the Regional Plan were being translated into Council specific activities, with notable exceptions such as urban heat mapping and the use of WSUD to better manage flood risk and support urban greening.

Despite this some of the staff at the face-to-face interviews noted that there are a number of activities associated with and explicitly designed for climate change adaptation. Staff noted that there is a focus on being a "climate-ready" community in the Strategic Plan.

4.2.11 Indicator 10: Climate Change Policy

Justification for this indicator

An internal climate change policy (or corporate standard) allows the organisation to place a climate change lens over all of a council's activities and use the existing system to drive adaptation. It can allow for the consistent application of standards, agreed use of information sources and specific triggers for change. Staff members in local government have a range of viewpoints regarding the existence of climate change. Adopting a formal policy places limitations on the extent that personal viewpoints affect the professional judgments of people who may be sceptical or deny the existence of climate change.

A formal policy can also drive concerted action for staff members who are complacent regarding the effects of climate change. There is evidence to suggest that the creation of a policy has helped other local governments to affect change. This has been an effective trigger for change in other local government' such as Kingborough Council (TAS), Mackay Regional Council (QLD) and Whitsunday Regional Council (QLD).

Staff survey results

The survey shows that 164 staff members (73%) believe that internal policies which direct action on climate change (e.g. a climate change policy) are very helpful in adapting to climate change impacts.

Quantitative assessment results

The Project Team searched the City of Adelaide's website for a climate change policy (which includes adaptation) and/or an environment/ sustainability policy, however, no relevant policies were found. This sees the City of Adelaide score 'None' for the Climate Change Policy indicator (see Table 16).

Table 16: The City of Adelaide's indicator score for Climate Change Policy

Level (Score)	Indicator Description
None (0)	No publicly available (council endorsed) climate change adaptation policy was found. There may be an environment/ sustainability policy however it does not mention climate change.
Basic (1)	Climate change is considered in either a climate change policy OR environment/ sustainability policy. There are prescribed responses ¹ / guidance for one climate change issue ¹ (e.g. bushfire) AND/OR one council function ¹ (e.g. land use planning) only.
Intermediate (2)	Climate change is considered in either a climate change policy OR environment/ sustainability policy. Detailed inclusion of climate change, but is limited to two climate change issues (e.g. bushfire) AND/OR two council functions (e.g. land use planning).
High (3)	A specific climate change policy exists and considers numerous climate change issues. Must also reflect the latest science - most recent IPCC assessment report from the date of publication. Does not have all the attributes listed in the 'Advanced' score level.
Advanced (4)	A comprehensive climate change policy exists. It must include ALL of the following: key performance indicators, identified roles and responsibilities, the timing for delivery, linked to governance (mainstreaming), community and/or stakeholder engagement.

¹ See Appendix C for definitions of prescribed responses, climate change issues and council functions

Specific recommendations for quantitative assessment

The Project Team recommend the following as a first step for the City of Adelaide to transition from 'None' to 'Basic' in the Climate Change Policy indicator:

A climate change adaptation policy will help ensure Council's method for adapting to climate change is consistent and robust. If council is to implement a climate change policy then it should include all of the following: specific IPCC climate change scenarios it is aligning to (preferably RCP 8.5 as a minimum), identified roles and responsibilities, timing for delivery, triggers for review (e.g. within 6 months of each IPCC assessment report), activities for improving governance scores, (mainstreaming), and commitment to community and/or stakeholder engagement. The most cost-effective approach to this would be to glean information from other Councils in South Australia or Australia who have participated in an Informed.City™ climate change adaptation governance assessment and have an advanced climate change policy.

Findings from the face-to-face meetings

Staff noted that Council did not have a specific Council scale climate change policy. However, many staff interviewed stated that they thought a specific climate change policy would help drive consistent decision-making through the organisation.

4.3 Results and Recommendations for Qualitative Assessment

The results for the qualitative assessment focus on the seven indicators that are identified as key drivers for implementing climate change adaptation governance. The analysis of each indicator will discuss the importance of the indicator, staff survey results, qualitative assessment results, and specific recommendations.

4.3.1 Indicator 11: Climate Risk Assessments

Justification for this indicator

Climate change risk assessments provide organisations with the critical information they need to understand the impacts that climate change may present. Risk assessments take many forms, although in Australia most of them tend to follow the ISO Risk Assessment Framework AS31000.

Understanding specific risks is a complex task, and undertaking detailed risk assessments can be expensive, time-consuming and involve numerous experts and stakeholders. Because of these limitations, many local governments have opted for scoping or high-level risk assessments. Scoping risk assessments involve a smaller number of climate change scenarios and local governments are usually focussed on Council's corporate risks (as opposed to also understanding environmental, social and economic risks).

Although scoping assessments are always useful for quickly identifying general risks and areas that require further investigation, their ability to accurately reflect the level of risk is limited by the investment in time and resources that go into them.

Staff survey results

In the online survey, respondents were asked if their department uses climate change risk assessments to inform decision making (see Figure 9). The results indicate more staff members who do not use climate change risk assessments, with 41% responding 'No' (101 staff members). Also, 20 staff members (8%) stated that their department uses climate change risk assessments regularly, and another 41 staff members (17%) identified using risk assessments only sometimes. Interestingly, there are 160 staff members (72%) who believe that guidance on risk assessment and reducing risk exposure for councils would be very helpful in adapting to climate change impacts.

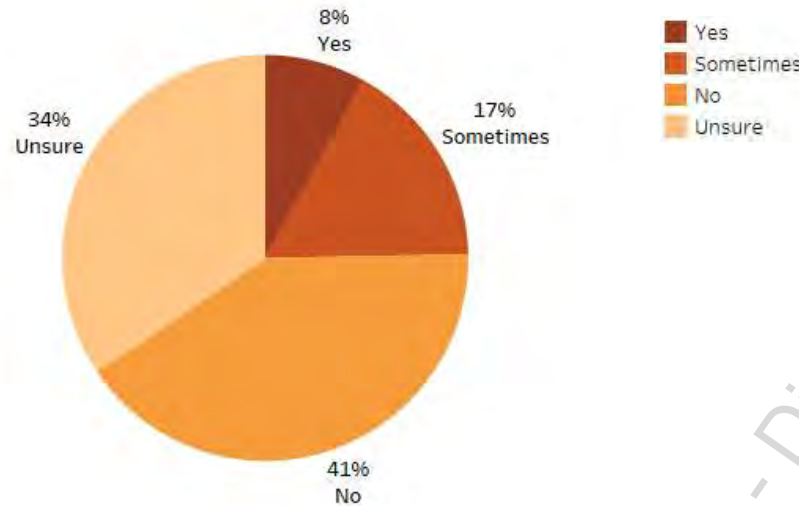


Figure 9: Use of climate change risk assessments in the City of Adelaide departments

Qualitative assessment results

A climate change risk assessment is currently being developed as part of this broader climate change project. Staff noted that some specific risk assessments have been undertaken but there is no overarching project that explores all of Council's climate change risks.

Staff discussed numerous climate-related risks during the meetings including the potential:

- impact of extreme heat on residents and retail trade, especially in parts of the city with limited shade;
- greater requirements for support for heat stress for visitors to the city of for the homeless;
- impact of extreme heat on major outdoor events;
- influence of hotter and drier conditions on greening across the City - specifically tree health;
- increased requirements for irrigation due to longer periods of hot and dry conditions, which will in turn influence operating costs;
- increased costs for operating facilities and buildings due to a greater need for cooling;
- further changes to work hours to reduce the need for staff to be outdoors during hot weather;
- devaluation of assets due to reduced performance and operating life; and
- increase in liability claims from hazards such as flooding.

Specific recommendations of the qualitative assessment

- 11.1 Identify the process by which climate risk assessment results can feed into the Strategic Risk Register.
- 11.2 Agree on a process by which high priority projects, especially new large-scale infrastructure projects or developments, are subject to climate risk assessments prior to approval.

4.3.2 Indicator 12: Climate Legal Risk

Justification for this indicator

Climate change is emerging more and more as a climate legal risk problem that governments, organisations and the community are attempting to understand, avoid and manage. The nature of climate legal risk for local governments is a minefield that can manifest itself in many ways.

There has been a marked increase in legislation associated with managing climate change, especially in coastal regions (e.g. sea-level rise and land use planning). How a Council interprets new regulations can become a point of conflict, especially if there is the potential for legislation to affect the value of property or the rights to development.

The climate legal risk facing local governments is not just limited to land use planning decisions. The ramifications of ignoring climate legal risk can include:

- Risk of increased planning challenges and negligence. (Baker-Jones, Burton, Bell, & Chang Seng, 2013)
- Risk of criminal negligence if a person is harmed due to a council's action (or inaction).
- Risk of unplanned financial expenditure defending legal challenges. There is anecdotal evidence of councils in Australia spending millions of dollars on single lawsuits.
- Risks associated with releasing or withholding information about projected climate change risks. (Productivity Commission, 2012)

All the above have the potential to have a considerable negative impact on a council's financial sustainability. There is the very real potential that just one lawsuit could erode a council's financial resilience.

Staff survey results

In the online survey, 19 staff members (8%) stated that they see apprehension about legal risk as a barrier to implementation of climate change adaptation actions (e.g. legal risk associated with undertaking climate change adaptation). On the other hand, staff members acknowledged that a better understanding of the legal risks would help to incorporate climate change in their work, with respondents identifying 'duty of care responsibilities' (87 staff members, 39%) and 'resolved liability concerns' (20 staff members, 9%) as enablers to climate change adaptation.

Qualitative assessment results

The assessment found that Council has not sought independent legal advice for any specific climate-related risks and that the respective role of Council compared to residents and businesses in responding to climate risks is unclear.

There was a strong interest in better understanding what Council's statutory requirements are in relation to risk management. Some of the staff noted that they had attended a climate legal risk presentation and that it was an issue that was still in the embryonic stages of understanding within the organisation.

The City of Adelaide has not been required to attend court or a tribunal for any climate change planning issues (e.g. related to development applications). Furthermore, Council's insurer (the Local Government Association Mutual Liability Scheme) has not requested any specific information about how Council is managing its climate change risk.

Participants did not identify any instances where Council had refused developments based on climate change risks.

Specific recommendations of the qualitative assessment

- 12.1 Identify priority areas for climate legal risk advice, especially about the relative role of Council compared to residents, businesses, and the State Government.
- 12.2 Ensure that legal risks associated with climate change are included in the risk register, until well managed.

4.3.3 Indicator 13: Staff Capacity and Resource Allocation

Justification for this indicator

Monitoring Council's resource and staffing commitment to climate change is critical to supporting ongoing climate change adaptation. If a council only relies on external consultants for adaptation research and responses, then it is doing very little to support the improved internal adaptive capacity of its organisation. Furthermore, without a permanent adequate annual budget, a council will only be able to undertake adaptation actions in an ad hoc manner. The overarching goal for adaptation should be to mainstream consideration of climate change across all council activities.

Staff survey results

In the online survey, 90 staff members (39%) identified a lack of training and learning opportunities for staff as a barrier to the implementation of climate change adaptation actions. Other barriers identified include limited staff capacity - number of staff (82 staff members, 35%), and staff capability - skills (73 staff members, 31%). On the other hand, training opportunities were recognised as an enabler of climate change adaptation action by 105 staff members (47%). Respondents also identified other enablers including assigned staff responsibilities (94 staff members, 42%), staff champions (75 staff members, 33%), and peer-to-peer learning (73 staff members, 32%). Also, 50% of respondents (107 staff members) believe that capacity building is very helpful in adapting to climate change impacts.

Qualitative assessment results

There was a broad understanding of the importance of climate change as an issue presenting risks and opportunities for Council. This awareness was driven to a large degree by the Council's commitment to the Carbon Neutral Adelaide initiative and, to a lesser extent, the Resilient East Regional Climate Change Adaptation Plan.

Many participants indicated an understanding of climate change adaptation activities directly relevant to their functional areas, covering both services and assets.

While many staff stated they had a general understanding of climate change there was a consensus that additional tailored training would be beneficial. The staff noted that Council was supportive of professional development activities. Some staff expected that they were likely to be exposed to training from peak bodies as the issue emerged further.

Specific recommendations of the qualitative assessment

- 13.1 Review opportunities to embed capacity building into existing staff training, such as new employee inductions.
- 13.2 Develop a capacity-building program to continue to raise staff awareness about climate change impacts and how they can be managed within different Council functions. This should be an ongoing program similar to how workplace health and safety training is conducted across the organisation.

4.3.4 Indicator 14: Community/ Stakeholder Engagement

Justification for this indicator

Connecting to the community is a core component for developing a safer, more resilient community. It is the local community who will bear the brunt of climate change impacts as they directly or indirectly contribute towards adaptation efforts (e.g. through increased insurance costs, taxes, and voluntary community actions). Given the fact that climate change is a contentious issue and one that is open to misinterpretation and misinformation, there is a strong imperative for Council to ensure that the community is appropriately informed of the issue.

As well as being informed, it is also essential that the community become active participants in the climate change adaptation process. According to Gardner et al. (2009), there are several considerable benefits associated with actively including the wider community in the decision-making process. These include:

- Facilitating clear communication and exchange of information, with all parties involved developing a more thorough understanding of issues, potential solutions and alternative perspectives.
- Improving the effectiveness of decision-making processes, by gaining better insight into potential equitable outcomes, solutions to conflicts and effective planning.
- Strengthening the resources of involved groups, by increasing awareness, confidence, skills and co-operation.
- Improving the sustainability of any initiatives, by increasing the quality of decisions and their acceptance amongst stakeholders. (Gardner, Dowd, Mason, & Ashworth, 2009)

Councils need to commence a dialogue with the private sector and better understand how businesses and local governments can learn from each other's understanding of the risks and approaches to adaptation.

Staff survey results

In the online survey, 45 staff members (19%) agreed that climate change not being seen as a priority for the community is a barrier to the implementation of climate change adaptation actions. The results also highlighted the importance of the local community – with 55% of respondents (123 staff members) stating that having an active and engaged community is a core enabler for improving Council's ability to plan for climate change.

Qualitative assessment results

Community awareness about climate change has become an important driver for action within Council. This is reflected in Council's commitment to Carbon Neutral Adelaide and the declaration of a Climate Emergency.

The City has a strong community engagement focus, working proactively with residents, businesses and other organisations such as universities. Examples of past Council engagement that support climate change action include heat preparedness messaging before and during heatwave events, participation in the 'Hot Hot Hot' event, and community engagement about the value of city greening through the use of tree tags.

It was noted that there is a focus on being a 'climate-ready' community in the Strategic Plan and messaging with the community is centred on empowerment rather than a 'fear-based' approach.

Participants did not identify any instances where Council has worked with Indigenous traditional owners of the land regarding climate change issues.

Specific recommendations of the qualitative assessment

- 14.1 Develop a Climate Change Stakeholder Engagement Strategy, which identifies engagement objectives, target audiences, engagement channels, a schedule of activities, and KPIs. This should include issue-specific engagement (e.g. heatwave risks) as well as general awareness-raising.

4.3.5 Indicator 15: Institutional/ Intergovernmental Relationships

Justification for this indicator

Climate change is a trans-boundary issue. Adaptation action (or inaction) by one stakeholder can both improve and erode the resilience of another. Furthermore, economies of scale and collectively sharing knowledge can improve adaptation governance. The actions by a range of organisations have the potential to affect councils' resilience. An important part of the institutional arrangements and engagement with external stakeholders is the clarification of roles and responsibilities that are associated with climate change adaptation.

Staff survey results

In the online survey, 59 staff members (25%) recognised that dealing with other government agencies is a barrier hindering Council's ability to plan for climate change. Conversely, respondents also identified regional coordination (52 staff members, 30%) and external agency support (45 staff members, 26%) as enablers to the implementation of climate change adaptation actions. Interestingly, 137 staff members (79%) from the City of Adelaide identified senior management support as a core enabler contributing to Council's ability to plan for climate change.

Qualitative assessment results

There was a view among some participants that the relative roles and responsibilities of local government as compared with the State Government about responding to climate change was

unclear at present. It was suggested that this issue requires clarification as part of the next phase of climate change planning within Council.

Specific recommendations of the qualitative assessment

- 15.1 Seek to clarify the role of Council as compared with the State Government about managing climate risk.
- 15.2 Work with banks to better understand broader market risk and how they are considering the effects of climate change. It would be in the City's interest to identify how banks identify risk and what they see determines resilience at a City level. This may help City of Adelaide understand risk to rateable income due to property value risk. Where possible the City of Adelaide should identify opportunities to incorporate risk definitions used by the banking sector into its risk management approach.

4.3.6 Indicator 16: Climate Change Information

Justification for this indicator

Understanding the impacts of climate change requires access to climate change information. While institutions such Commonwealth Scientific and Industrial Research Organisation (CSIRO) and universities freely provide valuable publications on climate change risk and adaptation, obtaining climate change projections (e.g. from climate change models) is often a time consuming and expensive task, or one that can misalign with Council's timing needs. Council can obtain relevant climate change information from several sources including government databases, university/ institutional relationships, desktop research, consultants and software (SimCLIM).

Understanding the information that goes into climate change models greatly helps the user understand the uncertainty associated with the climate modelling process. The differing greenhouse gas emissions scenarios, models chosen, downscaling and climate sensitivity can all yield differing results. This has the potential to confuse end-users at best and at worst lead to poorly informed decision making.

Staff survey results

The results also show that the City of Adelaide staff members recognise the role information can play as barriers and enablers to implementation of climate change adaptation actions. There were 64 staff members (28%) who identified a lack of information/ data as a barrier to climate change adaptation actions and 95 staff members (42%) who considered access to accessible and up-to-date information/data as an enabler. This supports respondents' preference of support tools for adapting to climate change impacts since 77% of respondents (172 staff members) believe that the provision of consistent, high-quality information, knowledge and tools about climate change is very helpful in adapting to climate change impacts. Similarly, localised climate data and information was found to be very helpful for 123 staff members (61%).

Respondents of the online survey identified the internet, traditional media, and social media as being the top three information sources commonly used by staff members to understand climate change impacts (see Figure 10). There are also a range of other information sources which Council staff members use including peak body associations, CSIRO, and someone in Council. It should be

noted that 28 staff members (12%) acknowledged that they do not look for information about climate change.

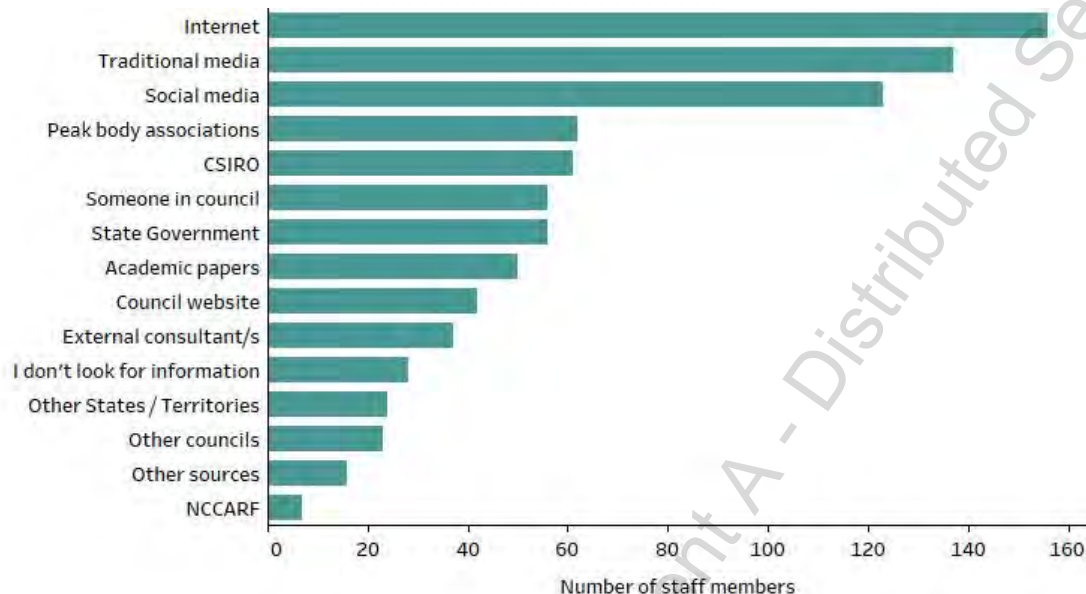


Figure 10: Information sources commonly used by the City of Adelaide staff members to understand climate change impacts

Staff members were also asked what types of information would help them to better incorporate climate change into their job. The two most popular responses were 'knowing what to actually do' (140 staff members, 63%) and knowing the 'anticipated impacts for my department' (57 staff members each, 57%). There were also 118 staff members (53%) who agreed that local climate projections/ forecasts would help in the implementation of climate change actions (see Table 17).

Table 17: Types of information which would help the City of Adelaide staff members incorporate climate change into job

	Number of staff members	% of staff members
Knowing what to actually do	140	63%
The anticipated impacts for my department	128	57%
Local climate projections / forecasts	118	53%
Knowing who to turn to for help	105	47%
Knowing who should be managing the issue in council	98	44%
Understanding what other councils are doing	97	43%
Knowing when we should start implementing adaptation actions	88	39%
Understanding the regulatory requirements	78	35%
Regional climate projections / forecasts	76	34%
Understanding potential trade-offs	71	32%
Knowing which level of government should be responsible for action	65	29%
Understanding legal implications	54	24%
Not sure	23	10%
Other	7	3%

	Number of staff members	% of staff members
None	3	1%

Qualitative assessment results

The City of Adelaide has used information about climate change from the IPCC, CSIRO, the Bureau of Meteorology, and various other scientific organisations, as presented and summarised in the Resilient East Regional Climate Change Adaptation Plan. This information is also being used as the basis of the current physical risk assessment. It was also noted that information such as the urban heat mapping has been used to build the business case for investment in greening, WSUD and inform discussion regarding materials selection.

At the face-to-face meetings, some staff stated that they were likely to have climate change information readily available but were unsure about which information they should be using. Staff members also acknowledged that a climate change policy would help direct staff to robust information sources including what type of climate projections information should be used.

Council has not made a formal whole-of-council decision regarding the sharing of information with the community or business owners regarding areas or assets that may be at higher risk due to climate change hazards.

Specific recommendations of the qualitative assessment

- 16.1 Develop a register of information requirements needed to inform key decisions that will be impacted on by climate change to identify where information gaps exist. This should be done as part of implementing a monitoring and evaluation plan and directed by a Climate Change Policy.

4.3.7 Indicator 17: Information Systems

Justification for this indicator

As the information technology age continues to shape our society it comes as no surprise to see that information services are playing an increasing role in supporting council operations and providing a new interface with the community it serves.

Information communication technology (ICT) networks such as social media platforms, websites and information portals have the potential to contribute significantly to Council's climate change adaptation ambitions. For example, ICT systems can be used for the monitoring and control of critical infrastructure and assets. According to a research report by Arup et al. (2013), 'improved monitoring and control capabilities for all infrastructure can enhance resilience by providing detailed and rapid information to utility managers and city leaders regarding operating conditions and performance'.

Furthermore, during extreme events, the ICT network are emerging as a natural agglomeration for concerned community members seeking information when disaster strikes. For example, Brisbane City Council maintains a social media hub (based on the social media aggregation site Stackla). This site became a main focal point for community engagement with Brisbane City Council and between residents who were able to upload information about the risks in real-time (Stackla, 2013).

Managing social media, however, requires constant attention as poor management of social media during extreme events can also cause confusion and do more harm than good.

Qualitative assessment results

Council's website was analysed for climate change and its integration with other information systems. The website includes working connections to six social media platforms including Facebook, Twitter, Instagram, LinkedIn, YouTube, and WeChat. Also, the website has a dedicated page for climate change which explains the projected climate trends for the City and shows projects Council are working on to respond to climate change, including the Resilient East Regional Climate Change Adaptation Plan. The City of Adelaide has also established an online community hub called 'Your Say Adelaide'. This website is a consultation hub where the community can engage with Council and have their voices heard about issues in the region.

The City of Adelaide has a Facebook account with 51,449 'likes' and 53,967 people following the page (as of February 2020). Council have also been a member of Twitter for 11 years (joined in February 2009) and in that time have gained 97,400 followers. These statistics show that Council has a high level of social media presence with considerable reach. There is a consideration of climate change in Council's posts which are focussed on awareness of climate-related hazards (i.e. heatwave) and Council's carbon emissions initiatives and targets and engagement for climate change community events. These results show that the City of Adelaide has actively communicated with the community about climate change issues. However, with such a large group of followers, there is an untapped potential for engagement which Council could utilise to improve community awareness on hazards and share information and build knowledge about climate change.

Specific recommendations of the qualitative assessment

- 17.1 Utilise Council's Smart City initiative to collate and analyse risk information and explore the potential role of GigCity as a platform for improved information systems.
- 17.2 Sponsor GovHacks and local hackathons with the focus being solely on climate change adaptation.
- 17.3 Provide an annual publication of data collected in Council's accounting system on post extreme event/ disaster clean-up costs/ resource use. This will assist with communicating impacts to the community over time.

5 Conclusions

The City of Adelaide has a sophisticated understanding of climate change and overall has achieved a good score in the quantitative climate change governance assessment. Council's commitment to net-zero emissions sees it achieve an 'Advanced' score in the Greenhouse Gas Emissions Reduction indicator. Also, Council scored 'High' in Financial Management and Adaptation Planning and achieved an 'Intermediate' score for three other indicators (Strategic Planning, Asset Management and Land Use Planning). It is worth highlighting that four indicators did not achieve a score. These were Public Risk Disclosure, Emergency Management, Climate Risk Management and Climate Change Policy.

The key climate-related risks identified during the interviews were predominantly physical. These include risks associated with heatwaves, water availability and stormwater flood risk. Council staff

had a strong recognition that, if not managed effectively, climate change has the potential to pose a significant financial strain on the organisation.

There is no doubt that the City of Adelaide has a highly skilled staff base and are well-placed to become a national leader in the identification and management of climate change risks. There is a unique opportunity to use the Smart City initiative to help analyse, monitor, and report on climate-related risks.

While some specific recommendations are presented in the report the key issues are associated with the need to formally capture climate change risk in the corporate risk management framework. It is likely if this were to occur then the scores in all the remaining indicators would also improve quickly.

6 References

- Arup, RMT & Siemens. (2013). *Toolkit for Resilient Cities: Infrastructure*. Technology and Urban Planning. Retrieved April 10, 2017, from <https://www.siemens.com/content/dam/internet/siemens-com/global/company/topic-areas/intelligent-infrastructure/resilience/toolkit-for-resilient-cities.pdf>
- Baker-Jones, M., Burton, D., Bell, J., & Chang Seng, D. (2013). *Climate change adaptation: Guided by the Law DLA Piper*. Retrieved April 10, 2017, from <http://www.dlapiper.com/files/Uploads/Documents/climate-change-adaptation-guided-by-the-law.pdf>
- City of Adelaide. (2016). *Adelaide Design Manual*. Retrieved 05 21, 2020, from <http://www.adelaidedesignmanual.com.au/>
- Clos, J. (2015). *From COP21 to the New Urban Agenda*. (U. Chronicle, Producer) Retrieved May 22, 2019, from <https://unchronicle.un.org/article/cop21-new-urban-agenda>
- Edwards, I., Burton, D., & Baker-Jones, M. (2017). *Governance Directions*. Feature Article - Risk Management. Retrieved March 2017
- Gardner, J., Dowd, A.-M., Mason, C., & Ashworth, P. (2009). *A framework for stakeholder engagement on climate adaptation*. CSIRO Climate Adaptation Flagship Working paper No.3. Retrieved April 10, 2017, from https://research.csiro.au/climate/wp-content/uploads/sites/54/2016/03/3_CAF_WorkingPaper03_pdf-Standard.pdf
- Government of South Australia. (2012). *Prospering in Changing Climate: A Climate Change Adaptation Framework for South Australia*. Retrieved May 21, 2019, from <https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/prospering-in-a-changing-climate-adaptation-framework-sa.pdf>
- Government of South Australia. (2016). *State Emergency Management Plan - Part 3: Guidelines and Frameworks*. Retrieved May 27, 2019, from https://www.dpc.sa.gov.au/__data/assets/pdf_file/0018/45702/Emergency-Management-Lessons-Management-Framework.pdf
- Government of South Australia. (2018). *About development plans*. Retrieved May 20, 2019, from <https://www.sa.gov.au/topics/planning-and-property/development-plans/guidance-and-application/about-accessing-development-plans>
- Government of South Australia. (2019). *Local Government Act 1999*. Retrieved May 20, 2019, from <https://www.legislation.sa.gov.au/LZ/C/A/LOCAL%20GOVERNMENT%20ACT%201999/CURRENT/1999.62.AUTH.PDF>
- Government of South Australia. (n.d.). *Planning, Development and Infrastructure Act 2016*. Retrieved May 20, 2019, from <https://www.legislation.sa.gov.au/LZ/C/A/PLANNING%20DEVELOPMENT%20AND%20INFRASTRUCTURE%20ACT%202016/CURRENT/2016.14.AUTH.PDF>
- Kim, B.-Y., & Kim, J. (2007). *Increasing Trust in Government through more Participatory and Transparent Government*. Presidential Committee on Government Innovation & Decentralization. Retrieved October 8, 2018, from <http://unpan1.un.org/intradoc/groups/public/documents/un/unpano31741.pdf>
- NCCARF. (2013). *Challenges of adaptation for local governments: Guidance Policy Brief Number 5*. Retrieved June 5, 2017, from

http://www.nccarf.edu.au/sites/default/files/attached_files_publications/GOVERNMENT_070313_A4.pdf

Productivity Commission. (2012). *Barriers to Effective Climate Change Adaptation*. Canberra: Report No. 59, Final Inquiry Report. Retrieved April 10, 2017, from <https://www.pc.gov.au/inquiries/completed/climate-change-adaptation/report/climate-change-adaptation.pdf>

Resilient East. (2016). *Resilient East Regional Climate Change Adaptation Plan 2016*. for the Eastern Region in association with the Government of South Australia and the Australian Government. Retrieved February 24, 2020, from https://www.environment.sa.gov.au/files/sharedassets/public/climate-change/sector_agreements/sector-agreement-resilient-east-gen.pdf

Stackla. (2013). Brisbane Council, Cool in a Crisis. Retrieved April 10, 2017, from <http://stackla.com/project/brisbane-city-council-cool-in-a-crisis/>

TCFD. (2016). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Retrieved March 22, 2018, from <http://www.fsb.org/wp-content/uploads/Recommendations-of-the-Task-Force-on-Climate-related-Financial-Disclosures.pdf>

The City of Adelaide. (2015). *Carbon Neutral Strategy 2015-2025*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-carbon-neutral-2015-25.pdf?mtime=20190524100940>

The City of Adelaide. (2016). *Strategic Plan 2016-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/strategy-strategic-plan-landscape.pdf?mtime=20190509094049>

The City of Adelaide. (2019). *Integrated Business Plan 2019-2020*. Retrieved February 24, 2020, from <https://d31atr86jnqrq2.cloudfront.net/docs/plan-integrated-business-plan-2019-20.pdf?mtime=20190702122042>

7 Appendices

Appendix A: Questionnaire from staff governance survey

Introduction

The City of Adelaide are participating in a climate change governance assessment. This will help councils determine how they best respond to, or adapt, to climate change and manage current and future climate risks.

As part of the project we have prepared a very short (7 minutes max) survey, open to all staff. By agreeing to participate in the survey we will be able to generate more results that are tailored specifically for your Council and your department. The survey is anonymous.

Thanks for your time and if you have any questions please contact me directly on the details below.

Kindest regards,

Donovan Burton

donovan@climateplanning.com.au

Respondent Information

1. Which of the following best fits with YOUR department / job description? (multiple answers can be checked)

- | | |
|---|--|
| <input type="checkbox"/> Corporate Governance / Office of the CEO | <input type="checkbox"/> Water and Waste |
| <input type="checkbox"/> Customer Service | <input type="checkbox"/> Works |
| <input type="checkbox"/> Workplace Health and Safety | <input type="checkbox"/> Environment / Sustainability |
| <input type="checkbox"/> Human Resources | <input type="checkbox"/> Disaster / Emergency Management |
| <input type="checkbox"/> Finance | <input type="checkbox"/> Community and Recreation |
| <input type="checkbox"/> Assets | <input type="checkbox"/> Arts & Heritage |
| <input type="checkbox"/> Information Technology (IT) Services | <input type="checkbox"/> Fleet |
| <input type="checkbox"/> Geographic Information Systems (GIS) | <input type="checkbox"/> Procurement |
| <input type="checkbox"/> Communications, Media and Marketing | <input type="checkbox"/> Casual (no specific department) |
| <input type="checkbox"/> Planning and Development | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Engineering / Infrastructure | _____ |

2. Please rate YOUR understanding of climate change impacts and adaptation for your department/ job description (only one answer can be checked)

- ☐ I am not sure of my understanding
☐ I have no understanding
☐ My understanding is limited (I would need some support incorporating climate change adaptation into my tasks)
☐ I could comfortably incorporate/ consider climate change adaptation into any of my tasks

Climate Change Adaptation in your Department

3. How serious an issue do YOU think climate change is for your department? (only one answer can be checked)

- ☐ Unsure
- ☐ No issue
- ☐ Minor issue
- ☐ Somewhat - but not urgent
- ☐ Important issue that needs attention now

4. Does YOUR department use climate change risk assessments to inform decision making? (only one answer can be checked)

- ☐ Yes
- ☐ Sometimes
- ☐ No
- ☐ Unsure

Climate Change Adaptation in your Council

5. In YOUR opinion, what is your council's level of preparedness for responding to climate change impacts? (only one answer can be checked)

- ☐ Not sure
- ☐ Not prepared at all
- ☐ Not very prepared
- ☐ Fairly prepared
- ☐ Very prepared

6. When do YOU think climate change will impact your council's operations and procedures? (only one answer can be checked)

- ☐ Now - It has already had an impact
- ☐ Short term - In the next year
- ☐ Medium term - Within 15 years
- ☐ Long term - by 2050
- ☐ Very long term - by 2070 - 2100
- ☐ Never
- ☐ Not sure

Barriers to Council Adaptation

7. In your opinion, which of these BARRIERS currently hinder your council's ability to plan for climate change? (multiple answers can be checked)

- | | |
|--|--|
| <input type="checkbox"/> Limited assigned funding | <input type="checkbox"/> Lack of information /data |
| <input type="checkbox"/> Limited staff capacity (number of) | <input type="checkbox"/> Uncertain where to start |
| <input type="checkbox"/> Limited staff capability (skills) | <input type="checkbox"/> Dealing with other government agencies |
| <input type="checkbox"/> Confusing/changing policy at different levels of government | <input type="checkbox"/> Apprehensive about legal risk |
| <input type="checkbox"/> Lack of political will | <input type="checkbox"/> Lack of training and learning opportunities for staff |
| <input type="checkbox"/> Not seen as a priority by the community | <input type="checkbox"/> Not seen by management / executive as a priority |
| <input type="checkbox"/> Limitations in legislation and regulation | <input type="checkbox"/> Risks are not well understood |
| <input type="checkbox"/> Uncertainty of the role of Local Government | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Lack of organisational support | _____ |

8. In your opinion, which of these ENABLERS contribute to your council's ability to plan for climate change? (multiple answers can be checked)

- | | |
|--|--|
| <input type="checkbox"/> Senior management support | <input type="checkbox"/> External agency support |
| <input type="checkbox"/> Understanding of cost/benefits of climate change adaptation actions | <input type="checkbox"/> Peer to peer learning (e.g. through Greenhouse Alliance and other networks) |
| <input type="checkbox"/> Active and engaged communities | <input type="checkbox"/> Training opportunities |
| <input type="checkbox"/> Mayor/ councillor leadership | <input type="checkbox"/> Effective risk management practices |
| <input type="checkbox"/> External funding | <input type="checkbox"/> Good understanding of climate change |
| <input type="checkbox"/> Assigned staff responsibilities | <input type="checkbox"/> Accessible and up to date information/ data |
| <input type="checkbox"/> Duty of care | <input type="checkbox"/> Legislative / policy change at State level |
| <input type="checkbox"/> Avoiding future unbudgeted costs | <input type="checkbox"/> State Government support |
| <input type="checkbox"/> Regional coordination | <input type="checkbox"/> Other (please specify) |
| <input type="checkbox"/> Liability concerns resolved | _____ |
| <input type="checkbox"/> Staff champions | |

Level of Climate Change Adaptation Support

9. How HELPFUL are the following types of support in adapting to climate change impacts?

	Not helpful	Fairly helpful	Very helpful	Not sure
Provision of consistent, high quality information, knowledge and tools about climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guidance on risk assessment and reducing risk exposure for councils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Localised climate data and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internal policies that direct action on climate change (e.g. a climate change policy)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specific ongoing resource allocation for climate change projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State government statutory planning support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capacity building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Case studies in effective adaptation planning, strategies and implementation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordination with the South Australian Government effort to adapt to climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-statutory planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Education and community engagement tools and strategies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public statements of leadership and action from the State Government	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A climate change bridging organisation (e.g. A coordinating body for research, training, networking, guidelines etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sourcing Climate Change Information

10. Where do YOU get your information about climate change impacts? (multiple answers can be checked)

- | | |
|--|---|
| <input type="checkbox"/> I don't look for information | <input type="checkbox"/> Other councils |
| <input type="checkbox"/> Academic papers | <input type="checkbox"/> External consultant/s |
| <input type="checkbox"/> Traditional media (e.g. newspapers, news) | <input type="checkbox"/> Peak body associations |
| <input type="checkbox"/> Social media (e.g. Facebook, Twitter, LinkedIn) | <input type="checkbox"/> NCCARF |
| <input type="checkbox"/> Internet | <input type="checkbox"/> CSIRO |
| <input type="checkbox"/> Council website | <input type="checkbox"/> State Government |
| <input type="checkbox"/> Someone in council | <input type="checkbox"/> Other States / Territories |
| | <input type="checkbox"/> Other (please specify) |

11. What type of information about climate change impacts would help YOU incorporate climate change into your job? (multiple answers can be checked)

- ☐ None
 - ☐ Not sure
 - ☐ Local climate projections / forecasts
 - ☐ Regional climate projections / forecasts
 - ☐ The anticipated impacts for my department
 - ☐ Knowing when we should start implementing adaptation actions
 - ☐ Knowing what to actually do
 - ☐ Knowing who should be managing the issue in council
 - ☐ Understanding legal implications
 - ☐ Understanding the regulatory requirements
 - ☐ Knowing which level of government should be responsible for action
 - ☐ Understanding potential trade-offs
 - ☐ Knowing who to turn to for help
 - ☐ Understanding what other councils are doing
 - ☐ Other (please specify)
-

Climate Change Adaptation Training

12. Have YOU had any training for climate change adaptation? (multiple answers can be checked)

- ☐ None
 - ☐ Yes - a university or TAFE subject
 - ☐ Yes - a university Degree / Masters / PhD in climate adaptation
 - ☐ Yes - a university diploma / certificate in climate adaptation
 - ☐ Yes - from a peak body training package (e.g. Planning Institute of Australia or Engineers Australia)
 - ☐ Yes - from a consultant
 - ☐ Yes - from the Enhanced Local Government Service Delivery Course (Australian Centre for Excellence in Local Government)
 - ☐ Other (please specify)
-

Questions

13. Are there any other comments you would like to make about adapting to climate change in your council?

14. Would you like to be kept informed about the progress and outcomes of this project?

- ☐ No
☐ Yes (please type your email address)

Appendix B: List of keywords used for quantitative assessment

Theme	Definition/ Keywords
Climate change	Council documents were searched for keywords associated with climate change. These keywords include 'climate change', 'global warming' and 'climate variability'.
Sea level rise*	Council documents were searched for keywords associated with sea level rise. These keywords include 'sea level rise' and 'sea level change'.
Adaptation	Council documents were searched for keywords associated with adaptation. These keywords include 'adapt', 'adaptation', 'adaptive' and 'adaptability'.
Greenhouse gas emissions	Council documents were searched for keywords associated with greenhouse gas emissions. These keywords include 'greenhouse gas', 'GHG', 'carbon emission', 'carbon footprint', 'carbon neutral', 'carbon neutrality', and 'net zero'.

* only relevant for coastal councils

Appendix C: Questions used in the qualitative governance assessment

Consultants asked representatives of the City of Adelaide the following questions during face-to-face meetings for the qualitative governance assessment.

Indicator 11: Climate Risk Assessments

1. What do you perceive as council's key climate change risks?
2. Is council undertaking any other climate change risk assessments?
 - a. If yes, can you elaborate?
3. Does Council have a risk register, if so can you provide us a copy?
 - a. If no, can you please search the document to check if climate change is considered and copy the relevant sections?

Indicator 12: Climate Legal Risk

4. Has council sought independent legal advice regarding specific climate change issues?
 - a. If so, for which issues?
5. Have your insurers asked you to provide any specific information about how you manage climate change risks?
6. Has council had any litigation based on climate-related hazards (either direct or indirect impacts)? For example, extreme weather causing damage and death or sea wall causing injury or death.
7. In regard to land use planning, has council refused any developments because of climate change risks?

8. In regard to land use planning, has council had to go to court or a tribunal for any climate change and planning issues (e.g. related to development applications)?

Indicator 13: Staff Capacity and Resource Allocation

9. Does council have somebody specifically responsible for climate change adaptation (e.g. climate change adaptation officer)?
 - a. If so, what is their full-time equivalent (FTE)?
10. Does council have any programs/ policies that mandate climate change training for staff?
11. Have staff have had any training in climate change adaptation?
12. Are there any instances where your staff have applied their skills to climate change adaptation activities or projects?
13. Is there a budget allocated for up-skilling staff in climate change adaptation?

Indicator 14: Community/ Stakeholder Engagement

1. Does council have a climate change communication strategy (both internally and externally)?
2. Does council have Community Plan or Strategy?
 - a. If so, is climate change considered?
3. Has council engaged the community on climate change issues?
 - a. If so, what methods of communication do you use to engage the community (e.g. project specific meetings, face-to-face, social media)?
 - b. Were the community receptive?
4. Does council have any active community or business working groups for climate change that council facilitates?

Indicator 15: Institutional/ Intergovernmental Relationships

5. Is council involved in any **local, regional and State working groups** for climate change (e.g. C-CAT, LGAQ project, Regional Organisation of Councils, local working group, utilities working group)?
 - a. How often do you meet?
 - b. What is the purpose of the working group (e.g. information sharing, political lobbying)?
 - c. Do you collaborate on projects?
 - d. Do you have MOUs and/or formal agreements?
6. Is council involved in any **federal working groups** for climate change (e.g. NCCARF)?
 - a. How often do you meet?
 - b. What is the purpose of the working group (e.g. information sharing, political lobbying)?
 - c. Do you collaborate on projects?
 - d. Do you have MOUs and/or formal agreements?

Indicator 16: Climate Change Information

7. What sources of climate change information does Council use to guide decision making on climate change?
8. What climate data do you base Council decisions on (e.g. IPCC fifth assessment report, BOM)?
9. What systems do you have in place to ensure the data is up-to-date?
10. Do you have an Open Data Strategy?
 - a. If so, is climate data considered?

Indicator 17: Information Systems

11. Does Council have an active social media presence (e.g. Facebook, Twitter)?
12. Do Council's social media posts communicate or discuss climate change issues?
13. Does Council share its data with external online databases (e.g. data.gov.au)?
 - a. If so, how many datasets are available?
14. Does Council have a formal performance management system?
15. Does Council have any key performance indicators for managing climate change?
16. Does Council measure the number of properties exposed to certain risks?
17. Does Council measure how much each disaster costs for clean up?
18. Are there any other climate-related factors which Council measure in their performance management?
19. Do council undertake any big data analytics for climate change issues (e.g. number of people tweeting about heatwaves, paying third party to analyse accommodation during heatwaves, analysing Facebook likes for climate-related postings)?
20. Has the management of climate change been included in any community projects (e.g. hack-a-thons)?
 - a. Please explain the projects and what the outcomes were?

Appendix D: Key terminology used in the quantitative assessment

Terminology	Definition
Climate change adaptation issues	Issues related to climate change adaptation. They include the following: natural disasters, extreme weather, rainfall, heatwaves, sea level rise, bush fire, flooding, cyclones, storms, storm tide, erosion, drought, earthquake and landslide. These are only issues if they are specifically in the context of climate change (e.g. increased extreme rainfall intensity). This list only represents some of the climate change adaptation issues that can arise and is for indicative purposes only.
Climate change mitigation issues	Issues related to climate change mitigation. Examples of these may include emissions reduction, greenhouse gas emissions, carbon footprint, carbon emissions, carbon neutral, carbon neutrality, carbon sequestration, carbon dioxide (CO ₂), carbon dioxide equivalent (CDE), CO ₂ e, CO ₂ eq, carbon capture and storage (CCS), energy efficiency, net zero, carbon credits, carbon price, carbon tax, Emissions Trading Scheme (ETS), Carbon Pollution Reduction Scheme (CPRS), Renewable Energy Target (RET), Representative Concentration Pathways (RCP), Emissions Reduction Unit (ERU). This list only represents some of the climate change mitigation issues that can arise and is for indicative purposes only.
Climate change risks	Types of risks associated with climate change. Examples of these may include infrastructure risk, policy risk, market and competitiveness risk, climate legal risk, environmental risk, community risk, political risk, economic risk, financial risk, insurance risk. This list only represents some of the climate change risks that can arise and is for indicative purposes only.
Direct impacts (From acute and chronic physical impacts)	Direct impacts are impacts which are directly associated with any of the climate change issues. Examples of direct climate change impacts include damage to assets from storm surge, loss of life as a result of increased heatwaves etc. This list only represents some of the direct impacts that can arise and is for indicative purposes only.
Indirect impacts (From acute and chronic physical impacts)	Indirect impacts are impacts which are an indirect result of a climate change issue. Examples of indirect climate change adaptation impacts include: changes to insurance availability and affordability, increased mortgage risk, supply chain impacts, disease and disease vector changes, food insecurity, market shift, decreased rateable value, regulatory change, decreased credit ratings. This list only represents some of the indirect impacts that can arise and is for indicative purposes only.
Documents	<p>Documents is a collective term used to identify a group of different document types reviewed in the assessment. These documents types include, but are not limited to: policies, strategies, plans, frameworks, guidelines, and procedures.</p> <p>For example, the term 'financial management documents' was used to refer to the following documents which were assessed for the Financial Management indicator:</p> <ul style="list-style-type: none"> • Financial management policy • Financial management strategy • Financial management plan
Council function	A council function is a key function which Council provides. Examples of specific council functions include: land use planning, emergency management, natural environment, biodiversity, health and wellbeing, asset management, compliance, works, waste management, sewerage, potable water, community engagement. Please note that some councils do not undertake all of these functions.

Terminology	Definition
Planning theme	A planning theme is a topic which represents the policy intent of a Council's regulatory planning document (i.e. Planning Scheme, Development Plan). Examples of planning themes include: sustainability and resilience, natural environment and landscape, strong communities, settlement patterns, natural resources, integrated transport, infrastructure, water management, coastal areas, hazards etc.
Prescribed response	A prescribed response is an authoritative guide, direction or action on a specific issue or topic. For example, a prescribed response may include a template or guideline of how climate change adaptation should be actioned (i.e. analyse, plan, allocate resources, implement and monitor, evaluate and report).

Confidential - Item 17.1 - Attachment A - Distributed Separately

