
# Resilient Asset Management Project
# RESEARCH AND RECOMMENDATIONS REPORT

Government of South Australia
CITY OF HOLDFAST BAY
CITY OF MARION
CITY OF ONKAPARINGA
CITY OF MITCHAM

# Document History

**Document revision status**

| Version | Date | Summary of Changes | Author/Editor | Quality review |
|---|---|---|---|---|
| 0.1 | 24/11/21 | Initial draft | A Pannell | URPS review |
| 0.2 | 22/12/21 | Updated with changes from Steering Committee | A Pannell | Steering committee review |
| 1.0 | 21/04/22 | Final for publication | A Pannell | Steering committee review |

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# 1. Introduction

The Resilient Asset Management Project (RAMP) is a collaborative project between the four Resilient South councils (Cities of Marion, Mitcham, Holdfast-Bay and Onkaparinga).

The RAMP will assess the suitability of market ready and in-development products, tools and guidelines for assessing physical and non-physical climate change risks to assets, the impact of these risks on regional resilience and will identify options to mitigate these risks and build regional resilience. This assessment will lead to the development of a pilot project that may include one or more of these products, tools or guidelines. A key objective of the pilot project is to apply a participatory approach that will build the capacity of council staff to understand and manage climate risk to assets. It will also identify mechanisms for funding the preferred risk management approaches.

Research in recent years has found that a systems approach is needed to achieve resilience. This means thinking beyond the resilience of assets themselves to how the assets contribute to the resilience of the system and requires consideration of how to strengthen the asset and network as well as the place, city and region.

## 1.1 Purpose of this report

This Research and Recommendations Report has been prepared to summarise the context and research undertaken during Phase One of the RAMP, and recommendations for the pilot project to be undertaken in Phase Three.

This report includes:

- Policy and regulatory context
- Summary of current asset management practice by Resilient South partner councils
- Climate change impacts on assets - the case for change to reform asset management processes
- Barriers to change within existing systems and processes
- Description and review of tools and approaches to assess climate risk to assets
- Recommendations for action.

## 1.2 Project Background

The 2021 Sixth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC) notes that global temperatures will continue to rise with increases in the frequency and intensity of climate extremes.

Climate risks to councils are increasing as a result of more extreme events. Increasing costs associated with bushfire losses, heatwave related deaths and damage, coastal erosion, sea level rise and storm surge damage, impacts from flooding and storms are occurring across South Australia.

However, climate related risks are not just physical. Councils are also facing legal, financial and transitional risks that must be understood and managed.

Councils need to be well-equipped and prepared for supporting our communities and local economies through major disruption and shocks, including pandemics, extreme weather and climate change impacts.

Recent experiences associated with the 2019-20 bushfires and COVID-19 pandemic demonstrate the need for building resilience and reducing risk.

Councils already have an unfunded backlog of infrastructure projects and, as they secure funding or extend their borrowing levels to stimulate their local economies in response to COVID-19, it will be vital to ensure this funding is not wasted and contributes to building the resilience of communities and built environments to shocks and stresses and reducing risk.

It is currently difficult for asset managers to make the business case for climate ready investments in assets and infrastructure. This is partly because climate risk management is a new skill for asset managers, who face significant hurdles when considering how to address the impacts of climate change when operating, maintaining, renewing or upgrading assets.

Building the capacity of all council staff that are associated with the planning, design, construction, operation and funding of assets and infrastructure is therefore a critical component of the RAMP.

By sharing the outcomes of the RAMP project with Resilient South and other South Australia councils, the project will contribute to lifting standards for asset management across the local government sector.

CSIRO with Value Advisory Partners have developed an approach to accelerate resilience building across Australia called the Enabling Resilience Investment (ERI) approach. The objective of this project is to speed-up and scale-up the coordinated and collaborative efforts to address the systemic problems creating the widespread and chronic deficits in climate and disaster risk reduction and resilience investments in Australia and the region.

The RAMP will be a national case study testing the ERI approach, and the proposed approach described in this report has been developed to be consistent with the ERI approach.

# 2. Policy and regulatory context

Understanding the policy and regulatory environment for the RAMP will support councils to understand and communicate how building asset resilience will reduce risks to council in the long term. This section focuses on councils' responsibilities for asset management and addressing climate risks.

## 2.1 Legislative and policy context

### 2.1.1 Local Government Act 1999

As a service provider, asset owner and asset manager, councils have responsibilities to consider risks and take appropriate risk mitigation actions. Table 1 describes some of the primary responsibilities for councils in the *Local Government Act 1999* and their implications for asset management.

*Table 1 Local Government Act 1999*

| Council requirements under the Act | Implication for asset management |
|---|---|
| Provide infrastructure for its community and for development (Section 7) | Councils must provide infrastructure including local roads, stormwater management and community facilities that are able to function effectively at all times. |
| Prepare an infrastructure and asset management plan (Section 122) | Councils must consider future drivers of demand for infrastructure (including climate change) and how these may impact budgets for maintenance and renewal. |
| Undertake prudential review of major projects (Section 48) | Councils should review whole of life costs and risks to major projects including climate-related risk. |
| Make informed decisions (Section 6) | Councils must take account of readily available information (such as climate risk data and climate projections) when making decisions. |
| Take measures to protect their area from hazards (Section 7) | Councils must understand how climate change will impact hazards in their area and ensure the measures they take to protect their area from hazards reflects climate projections. |
| Give due weight in all plans, policies and activities to state and national objectives and strategies (Section 8) | Considering how policies and actions align with and contribute to state and national strategies including climate change strategies and policies. |

**Local government reform**

Options for local government reform were identified through an extensive consultation process throughout 2019. Council costs and financial accountability were identified as a key area of reform, in

particular improvement to the Local Government Act to ensure councils' financial management framework is robust and consistent[1].

The *Statutes Amendment (Local Government Review) Act 2021* was assented to by the Government in June 2021 and is now an Act of Parliament. The Act has not yet come into operation, however once operational it will require councils to:

- *Describe in their long-term financial plan the council's approach to funding council infrastructure*
- *Outline the intended source of revenue to fund services and infrastructure over the period of the plan*
- *Provide information relating to the long-term financial plan and infrastructure and asset management plan to a designated authority, including how any proposed rates changes are consistent with the long term financial plan and asset management plan.*

These changes emphasise the need for councils to have a robust asset management plan and a sound evidence base if they need to increase rates to fund increased maintenance, operations, renewals or new capital works.

## 2.2 Other legislation

Other legislation places responsibilities on councils relating to asset management, including:

The *Planning, Development and Infrastructure Act 2016* requires State Planning Polices including the Climate Change, Strategic Transport Infrastructure and Energy policies to be considered in the development of regional plans that consider regional land use and transport infrastructure and the development of the Planning and Design Code which will define zones that govern the use of an area. Data developed by the RAMP will provide a valuable information source for the development of the Regional Plans.

*South Australian Public Health Act 2011* requires councils to prepare Public Health Plans consistent with the State Public Health Plan, for which preparing for climate change is a priority. Social infrastructure (the facilities, places, services and programs that support and maintain community wellbeing) supports public health action. Responsibilities for "hard" social infrastructure such as community, health and cultural facilities generally lies with Council asset managers.

*Fire and Emergency Services Act 2005* requires councils to take reasonable steps to prevent or inhibit the outbreak of fire or spread of fire on land under their care, control or management (section 105G). Asset managers may be responsible for fuel load management on council parks and reserves.

## 2.3 Liability considerations

Legal liability may arise from a council's significant failure to fulfil their function or responsibilities described in the *Local Government Act 1999* or other relevant legislation.

[1] Department of Planning, Transport and Infrastructure (2019) *Reforming Local Government in South Australia Discussion Paper*, https://www.agd.sa.gov.au/sites/default/files/reforming_local_government_in_south_australia_-_discussion_paper_-_august_2019.pdf

A council may be liable if they are found to have acted negligently, for example by failing to reflect known risks (such as bushfire or flood risk) in planning decisions or by failing to manage flood risks in their asset management processes.

Councils may also be liable if known climate considerations are not taken into account, if they provide inaccurate information relating to known risks, or if they understate or overstate those risks, for example in asset management plans.

## 2.4 Council policies

The following section has been included to provide background on the policy context for each council to show how these align or differ between the four Resilient South councils with a focus on asset management, risk management and climate change.

The Resilient South Regional Climate Change Adaptation Plan was published in August 2014 and the Southern Region Local Government Implementation Plan 2015-2019 developed soon after. These plans referred to the need to embed adaptation within council asset management plans. The Regional Adaptation Plan is planned for update in 2022 and the RAMP will be a valuable input to the review.

### 2.4.1 City of Marion

**Strategic plan**

Two of the six core themes of the City of Marion Strategic Plan 2019-2029 directly relate to climate change and assets. These themes are: “Valuing nature: by 2040 our city will be deeply connected with nature to enhance people’s lives, while minimising the impact on the climate, and protecting the natural environment” and “Connected: 2040 our city will be linked by a quality road, footpath and public transport network that brings people together socially, and harnesses technology to enable them to access services and facilities”. Associated strategies under these themes refer to the need for managing infrastructure issues associated with extreme events and building community resilience in response to climate change.

**Asset management policy/strategy:**

The City of Marion has both an Asset Management Policy 2018 and an Asset Management Strategy 2019-2028. Their Asset Management Policy does not have any mention of climate resilience beyond their principle that “all relevant…environmental…requirements are to be taken into account in asset management”. In contrast, their Asset Management Strategy specifically recognises the challenge that climate change poses for asset management, asset life and functionality, and commits to appropriately considering climate change impact in asset management decision making.

**Risk management**

The City of Marion’s Risk Management Policy does not refer to assets in the context of climate change.

**Climate change/emissions policy**

The City of Marion’s Climate Change Policy commits council to responding to climate change, including through the management of council assets and infrastructure.

**Declared climate emergency**

The City of Marion has not declared a climate emergency.

### 2.4.2 City of Mitcham

**Strategic plan**

The Mitcham 2030 Plan has a Sustainable City goal which aims to 'sustain and improve our natural and built environments for today's and future generations'. This goal involves increasing climate change resilience but does not reference assets or infrastructure directly.

**Asset management policy**

The City of Mitcham's Asset Management Policy does not mention climate resilience.

**Risk management**

The City of Mitcham's Risk Management Policy does not mention assets in the context of climate change.

**Climate change policy**

The City of Mitcham does not have a Climate Change Policy. The Emergency Management Policy identifies that council will "integrate disaster risk into existing plans and decision-making (e.g. long-term financial plan, asset management plan, climate change plans, public health plans)" but this is not yet evident in council's plans.

**Declared climate emergency**

The City of Mitcham declared a climate emergency in October 2019. As a result, council has committed to a range of city power partnership pledges including incorporating zero emission design into all new Council buildings.

### 2.4.3 City of Holdfast Bay

**Strategic plan**

Our Place 2030 is the City of Holdfast Bay's Strategic Plan. This plan has an environmental theme that aims for 'a community connected to our natural environment'. While this theme does not have a strong connection to asset management, one of its sub-themes is to build an environmentally resilient city.

**Asset management policy**

The City of Holdfast Bay's Asset Management Policy does not refer to climate change.

Their Open Space and Public Realm Strategy 2018-2030 recognises the importance of considering the impact of climate change in the long-term management of public open space. It includes an objective to "ensure landscapes are adaptive to climate change (drought tolerant, sustainable) and water sensitive urban design principles are adopted."

**Risk management policy**

The City of Holdfast Bay does not have a Risk Management Policy.

**Climate change policy**

The City of Holdfast Bay does not have a Climate Change Policy. Its Environmental Strategy 2020-2025 has a strong focus on climate change, and outlines a goal to become "a sustainable, carbon neutral, and climate-proofed city [and] address our adaptability and resilience to a changing climate". Two priority actions under this strategy are to "undertake a climate adaptation risk assessment of Council governance systems and infrastructure" and to "improve coastal infrastructure to better deal with future sea level rise".

The Climate Ready Holdfast Bay document outlines Holdfast Bay's past climate change actions but does not take a forward looking approach.

**Declared climate emergency**

The City of Holdfast Bay declared a climate emergency in October 2019.

### 2.4.4 City of Onkaparinga

**Strategic plan**

The City of Onkaparinga's Community Plan 2030 recognises the threat that climate change poses to council. While there is no specific mention of assets and infrastructure, the plan aims to "respond to the impacts of climate change, reducing emissions and building community resilience."

**Asset management policy**

The City of Onkaparinga does not have an Asset Management Policy. The council has a Strategic Asset Management Plan that describes goals and objectives for asset management aligned with those of the Community Plan 2030.

**Risk management**

The City of Onkaparinga does not have a Risk Management Policy however does have a risk management framework that considers climate change.

**Climate change policy**

Council has noted that they will prepare a Climate Change Response Plan in 2022.

Their Green Cities Strategic Plan identifies the responsibility of council to ensure its asset management considers the impact of climate change.

**Declared climate emergency**

The City of Onkaparinga has not declared a climate emergency.

## 2.5 Task Force on Climate-related Financial Disclosures (TCFD)

The report on the *Recommendations of the Task Force on Climate-related Financial Disclosures* was published in June 2017 by the Financial Stability Board.[2]

The Recommendations of the TCFD require organisations to consider climate-related risks and climate-related opportunities. Risks include both transition risks associated with the transition to a lower-carbon economy (including policy, legal, technology, and reputation risks) and physical risks associated with a changing climate, including more frequent and intense extreme weather events and a shift in climate patterns. Climate related opportunities include increasing resource efficiency and subsequently decreasing operating costs, shifting energy use to low emission sources and the development of new products and services.

While the TCFD is primarily targeted at business and financial markets, the role of the public sector in government spending, revenue raising and borrowing means disclosure of climate-related financial risk is highly relevant. The TCFD has identified four major categories of financial impact across income (revenue and expenditure) and the balance sheet (assets and liabilities and capital and financing) through which an organisation's current and future financial position may be impacted. The functions, roles and responsibilities of local government intersect all four of these categories.

The TCFD made four recommendations and a number of supporting recommended disclosures across the themes of governance, strategy, risk management and metrics and targets.

The *2021 TCFD Status Report*[3] notes that governments around the world have begun to codify aspects of the TCFD recommendations into policy and regulation for companies operating in their jurisdictions.

As part of its response to the TCFD recommendations, the Australian Prudential Regulation Authority (APRA)[4] is undertaking a series of Climate Vulnerability Assessments (CVAs) of major Australian banks and engaging with the Australian Security and Investments Commission (ASIC) and the Reserve Bank to ensure a consistent approach is taken to recommendations based on the CVAs.

In addition, there are increasing calls for governments themselves to report climate risk disclosure such as from the Group of Thirty, a group of economic, financial, and academic leaders, that released a report in October 2020 calling for businesses, governments, and the financial community to mandate climate risk disclosure in line with the TCFD recommendations by 2030[5].

### 2.5.1 Climate risk disclosure and insurance

In 2021 for the first time, the local government insurer (Local Government Association Mutual Liability Scheme (LGAMLS)) requested information about council's climate change adaptation plans or strategies as part of their insurance renewal process.

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[2] Financial Stability Board (2017) *Recommendations of the Task Force on Climate-related Financial Disclosures,* https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf

[3] Task Force on Climate-related Financial Disclosures (2021) *2021 Status Report*, https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Status_Report.pdf

[4] APRA is an independent statutory authority that supervises institutions across banking, insurance and superannuation, and is accountable to the Australian Parliament, https://www.apra.gov.au/about-apra

[5] Reported in TCFD (2021)

It is likely that requests from insurers for councils to disclose known climate risks and information on the actions they are taking to reduce these risks will increase in coming years. The RAMP project will provide valuable information to support councils' response.

## 2.6 Climate adaptation governance assessments

The Informed.City™ Governance tool was developed to allow governments at all levels to assess their extent of climate change adaptation governance (https://informed.city/governance). In 2019 the Cities of Marion and Onkaparinga participated in the pilot of this tool. The City of Mitcham undertook their assessment in 2020 and the City of Holdfast Bay has recently commenced their assessment and expects to complete this in early 2022.

The approach includes assessment of ten quantitative and seven qualitative indicators for climate adaptation governance including asset management. The assessment of these indictors involves reviewing council's publicly available corporate documents and using a keyword analysis to identify the presence of words associated with climate change. From this, a closer analysis of the context (via staff surveys and focus groups) was undertaken to assess the extent of how these were considered in the relevant documents, ranked from no consideration to advanced consideration.

The Cities of Marion, Onkaparinga and Mitcham received a score of 'Basic' for asset management. This is consistent with other South Australian councils who have since undertaken the assessment.

Their asset management plans were noted to contain general statements about climate change or refer to key words relating to climate change in a general context.

Interviews with council staff commented that although there is no formal, mandated consideration of climate change in existing asset management planning processes, climate change is being considered in the design of some assets and assets that contribute to climate adaptation are being installed (eg WSUD).

## 2.7 Recommendations from the Auditor-General

As part of his 2021 Annual Report, the South Australian Auditor-General prepared a report on *Managing climate change in South Australia (*Part D)[6]. The Auditor-General notes the report was prepared because of "the fundamental significance of climate change" and focuses on risk management because of the "pervasive and extreme consequences of climate change".

The report provides a number of recommendations for the SA Government and agencies to manage climate risk including risks to assets, including:

- *ensuring that an agency's practices and systems help them to effectively achieve their responsibilities for planning and delivering climate-resilient infrastructure, buildings, housing and public spaces*
- *clearly evidencing, addressing and embedding infrastructure project considerations, such as those identified by Infrastructure SA, into decision-making, infrastructure business cases and solutions and project delivery*
- *assessing the risk of existing or future public assets becoming stranded due to climate change risks*

[6] Auditor-General (2021) *Managing climate change in South Australia (*Part D)*,*

- *reporting for actions to manage separate climate change risks in line with global practices, using the Task Force on Climate-related Financial Disclosures framework and*
- *integrating climate change risk exposure and implications in financial reporting amounts and disclosures.*

The report references Infrastructure SA's 20-Year State Infrastructure Strategy that notes the exposure of assets and infrastructure to physical and financial risk and the need to build resilience to climate change into long-term infrastructure planning. It suggests that government agencies should ensure public financial reports reflect what is known about exposure to and impact of climate risk, including when asset values may be adversely affected, changes in the useful life of assets and changes in expenditure.

Although these recommendations were made in relation to State agencies, they are also relevant for councils.

## 2.8 Infrastructure Australia

Sustainability and resilience is a key theme of the *2021 Australian Infrastructure Plan*[7]. The plan describes a vision of communities that "are able to resist, absorb, accommodate, recover, transform and thrive in response to the effects of shocks and stresses" including climate change. Although the Infrastructure Australia Assessment Framework for initiatives and projects to be included in the Infrastructure Priority List[8] includes detailed guidance for considering climate change risks, the 2021 Plan notes that no infrastructure project assessed by Infrastructure Australia has applied this guidance.

Infrastructure Australia and Infrastructure New South Wales have recently reported on research undertaken to identify opportunities to improve infrastructure planning to increase resilience[9]. The research has found that a systems approach is needed to achieve resilience. This means thinking beyond the resilience of assets themselves to how the assets contribute to the resilience of the system and requires consideration of how to strengthen the asset and network as well as the place, city and region.

Two papers have been delivered:

- *Advisory Paper 1: Opportunities for systemic change – identifies directions for transformational and system change including three key directions at the asset level:*
  - *Improve infrastructure investment decision-making*
  - *Collect and share information on asset and network vulnerability*
  - *Value blue and green infrastructure.*
- *Advisory Paper 2: Guidance for asset owners and operators in the short term – identifies short-term actions for asset owners and operators as a first step, including general guidance and sector specific guidance.*

[7] Infrastructure Australia (2021) *2021 Australian Infrastructure Plan* https://www.infrastructureaustralia.gov.au/sites/default/files/2021-09/2021%20Master%20Plan_1.pdf

[8] Infrastructure Australia (2018) Assessment Framework https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/infrastructure_australia_assessment_framework_2018.pdf

[9] Infrastructure Australia (2021) *A Pathway to Infrastructure Resilience* https://www.infrastructureaustralia.gov.au/publications/pathway-infrastructure-resilience-0

- *General guidance suggests infrastructure resilience assessments be undertaking including*

  *(1) assessing exposure of key assets,*

  *(2) determine consequences of service disruption and*

  *(3) increase resilience of key assets.*

*It suggests that asset management plans include natural hazard exposure and impacts on asset performance, actions to increase resilience and guidance for procedures and operations.*

- *Transport sector guidance includes consideration of emergency management (eg evacuation) and transport resilience, reviewing governance arrangements between transport agencies (eg local and state government) and support community decision making in relation to route or mode choices*
- *Water sector guidance refers to consideration of whole of system approaches such as Integrated Water Cycle Management.*

# 3. Council asset management

Through discussions with council staff responsible for asset management, information on the current systems and approaches used to manage assets was collated. This will be used to inform the development of the brief for the pilot project in Phase 3 of the RAMP and ensure the pilot project addresses each council's approach and system.

Through discussions with asset managers and the expert panel, consideration of asset management maturity was raised as a potential early phase of work to identify opportunities within council asset management systems.

Following a brief introduction to asset management maturity, this section provides a summary of each councils' asset management approach.

## 3.1 Asset management maturity

Asset management maturity is defined by the Asset Management Council (a technical society of Engineers Australia) as "the ability of an organisation to foresee and respond to its environment through the management of its assets, while continuing to meet the needs of its stakeholders".

There are a number of assessment frameworks used by asset managers to assess maturity, associated with the International Infrastructure Management Manual (IIMM), International Organisation for Standardisation (ISO) and the National Assessment Framework (NAF). These approaches are available through IPWEA. The NAF Maturity Assessment is commonly used by South Australian councils including the City of Marion and includes 11 competencies of asset and financial management, each with a number of assessment areas.

Despite the definition of asset management maturity referring to organisations responding to their environment, the maturity competencies do not include reference to the future climate, environmental sustainability, or resilience.

There is an opportunity for the RAMP to investigate the expansion of the maturity assessment to include climate risk. This assessment would build on the climate adaptation governance assessments (see Section 2.6) and would support evaluation of the success of the RAMP. It would also be of value to other councils in South Australia and Australia.

Discussions with David Jenkins and Steve Verity from IPWEA indicated support for the project and interest in being involved in preliminary discussions. They referenced the development of Practice Notes 12.1 (Climate Change Impacts on the Useful Life of Infrastructure) and 12.2 (Climate Resilient Materials for Infrastructure Assets) and noted Dr Jacqueline Balston's role in their development.

A number of members of the RAMP expert panel (including Dr Balston and Dr Theuns Henning) would be able to contribute valuable input and this recommendation is further explored in Section 7. Dr Henning has been working for many years in asset management maturity and was a lead author of the World Bank's report *Integrating Climate Change into Road Asset Management*[10]. In particular he has worked for the World Bank on building climate resilience in Small Island Developing States, recognising that transport assets are often one of the highest value assets.

[10] https://openknowledge.worldbank.org/handle/10986/26505

The LGA is currently supporting a project with IPWEA to undertake a sector-wide asset management and financial planning 'Maturity Assessment Report'. This project is in part driven by the local government reforms (see Section 2.1.1) and a need to support councils in infrastructure and asset management. Discussions with the LGA project manager indicated they would be keen to reference any information to support councils increase the resilience of their assets in the guidance they are developing.

The NSW Government have developed a Climate Risk Maturity Health Check Tool[11] to support organisations in the NSW Government sector assess their existing climate risk management capacity. While this tool is not focussed on asset maturity, there are a number of aspects of the Health Check that are applicable and could inform the development of an asset maturity assessment.

## 3.2 City of Marion

The City of Marion has defined 8 asset classes with responsibility and ownership across two key functions of council – City Services and City Development.

An asset management strategy was prepared in 2019 and describes Council's vision and strategic objectives for asset management along with key performance indicators for each objective.

Asset management plans for each class describe community and technical levels of service for all classes with service level hierarchies defined for open space assets. Future demands are also identified in the asset management plan with an indication of the impact on services and how these may be managed. The most recent 10-year asset management plans were prepared in 2020.

The City of Marion is currently implementing a new asset management system (Assetic). Currently asset data is stored in GIS for some assets (roads, footpaths and stormwater) and spreadsheets (buildings).

In 2017 the City of Marion undertook a baseline asset maturity assessment. This was repeated in 2019, 2020 and 2021 and is planned to occur again in early 2022.

| Asset management feature | City of Marion |
|---|---|
| Asset classes | 1. Coastal walkway<br>2. Fleet, plant and equipment<br>3. Stormwater<br>4. Transport (includes roads, kerb, footpath, bridges)<br>5. Water treatment and resources (wetlands, WSUD, creeks)<br>6. Artworks, culture and heritage<br>7. Buildings and structures<br>8. Open space |
| Total asset value | $1 billion |
| Asset management team structure | City Services – Engineering, Assets and Environment – Engineering and asset solutions (classes 1-5) |

[11] NSW Government (2020) Climate Risk Maturity Health Check Tool, https://www.google.com/url?client=internal-element-cse&cx=013828583255245889455:flfpzjwkxng&q=https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Section-4-PDFs/Climate-Risk-Ready/Appendix-B-Health-Check-Tool.xlsx&sa=U&ved=2ahUKEwiKl87e56_0AhVhyzgGHfiwDWYQFnoECAEQAQ&usg=AOvVaw03wVNFupn8NavjJeAIIeAR

| Asset management feature | City of Marion | |
|---|---|---|
| | City Development – City Property – Land and Property, Cultural Facilities/Marion Outdoor Pool, Sport and recreation (classes 6-8) | |
| Asset management plan hierarchy | Asset management policy<br>Asset management strategy<br>Asset management plans (8 asset classes) | |
| Asset management system used | Currently implementing Assetic AMIS<br>Will include buildings when complete<br>Asset data currently stored in GIS<br>Assets with value <$3000 generally not recorded. | |
| Assetic predictor platform used | Yes | |
| GIS data system used | ESRI | |
| Date of most recent condition assessments | Roads | July 2022 (planned) |
| | Footpaths | July 2022 (planned) |
| | Stormwater | Rolling 15 year CCTV inspection program schedule to start 2022 |
| | Coastal assets | Coastal Walkway is inspected at a Level 1 every 6 months. The last Level 3 was in 2019 and another Level 3 is scheduled for 2021. |
| | Buildings | Consultant condition assessment completed in 2020 |
| | Open space | Wholesale condition assessment undertaken internally in 2017. Rolling asset inspections are undertaken but this is for maintenance purposes only and not for condition assessment. |
| | Other | All other assets not listed here are on a rolling inspection program. There are some gaps in this program. These are all documented. |
| Asset condition assessment approach | Follows IPWEA guidelines | |
| Date of most recent asset management maturity assessment and approach used | IPWEA NAMS.PLUS Maturity Assessment<br>March 2021 (internal assessment)<br>Next planned for early 2022 (external assessment) | |
| Whole of life emissions considerations | Guidelines and policies in place but not yet operationalised to get Asset Owners to consider whole of life emissions up front. | |
| Asset class priorities for RAMP | 1. Roads | |

| Asset management feature | City of Marion |
|---|---|
| | 2. Buildings (service centre, civic centre, Cove civic centre, southern depot)<br>3. Stormwater |

## 3.3 City of Mitcham

The City of Mitcham's Asset Management Policy defines 4 classes of assets. Responsibility for buildings sits with the Community Safety and Development Services team in Council, with the other 3 categories in the Engineering and Horticulture team. Individual asset management plans have been prepared for transport and stormwater under the civil infrastructure class.

TechnologyOne is used to store data and is linked to GIS. TechnologyOne includes a field for service level but this is not currently used as there is no single score. There is a single score field for condition which relies on a calculation of weighted condition scores for more complex assets.

The City of Mitcham used the Assetic Predictor Platform annually to understand financial implications of renewal/replacement requirements. The Council have found this to be most useful when collated by asset class, compared to looking at assets individually.

Condition assessments are undertaken on a 4-year rolling cycle, with some undertaken internally and others by external contractors (eg bridges). All condition data is stored in the GIS with a single score stored in TechnologyOne.

The Asset Management Plans prepared in 2020 are noted to be quite high level and do not contain guidance on asset design. They refer to changes in demand with some plans providing more management response than others. Council staff noted that there is no direct instruction to consider climate adaptation response Council has declared a climate change emergency and has given overarching direction to consider the impact of climate change – specific targets for climate appropriate infrastructure are still being developed. The small council asset team have been considering climate adaptation in their decision making, for example using heat mapping to prioritise greening, overlaying stormwater and road opportunities.

Whole of life emissions are not yet a consideration in the asset management process however as Council has declared a climate emergency, this may be needed in the future.

Digital asset management plans have been prepared for public access that use GIS to share information on asset types, condition, maintenance and renewal and future planning and budgets. Future demands are included and mapping that shows areas where climate change factors (heat, wind, soil, bushfire & flooding) are projected to impact asset values (See https://www.mitchamcouncil.sa.gov.au/future-city/innovation-in-mitcham/digital-asset-management-plans).

| Asset management feature | City of Mitcham |
|---|---|
| Asset classes | 1. Civil Infrastructure<br>- Transport (including roads, kerbs, bridges and car parks)<br>- Stormwater (including pipes and pits)<br>2. Open space<br>3. Buildings<br>4. Plant and machinery |

| Asset management feature | City of Mitcham | |
|---|---|---|
| Total asset value | $527 million | |
| Asset management team structure | Engineering and Horticulture – civil and infrastructure asset management, design services, engineering services, open space asset management, stormwater management,<br>Community Safety and Development Services - building | |
| Asset management plan hierarchy | Asset management policy<br>Asset management plans | |
| Asset management system used | TechnologyOne<br>Non-commissioned assets (generally value <$1000) not recorded | |
| Assetic predictor platform used | Yes – typically update annually<br>Integrated with ESRI GIS data | |
| GIS data system used | ESRI | |
| Date of most recent condition assessments | Roads | December 2021 (planned) |
| | Footpaths | December 2021 (planned) |
| | Kerbs | December 2021 (planned) |
| | Stormwater | November 2021 (planned, partial network) |
| | Bridges | 2018, planned for 2022 |
| | Buildings | 2021 - managed by property team |
| | Open space | Q1 2022 (planned) |
| | Other | Street trees – about 58,000 trees<br>Car parks not yet included |
| Asset condition assessment approach | Assets are condition assessed on a 1-5 scale in line with industry guidelines and specific Council intervention thresholds. Assets are assessed on a rolling 4 year schedule. | |
| Date of most recent asset management maturity assessment and approach used | NAMS PLUS undertaken 2018<br>Recently assessed transport asset maturity – identified weaknesses in documentation | |
| Whole of life emissions considerations | Not yet part of process | |
| Asset class priorities for RAMP | 1. Bridges<br>2. Selected buildings<br>3. Roads<br>4. Stormwater | |

## 3.4 City of Holdfast Bay

The City of Holdfast Bay Asset Management Policy defines 5 classes of asset and responsibilities of the asset managers for each class. The Asset Management Team (three personnel) sit in the Assets and Delivery team. The 5 asset managers are in the Assets and Delivery team and the Public Realm and Urban Design team of council.

Asset management plans were prepared in 2020 and describe current and desired levels of service. Future demand, demand impacts and management response are included. Climate change is noted to have a potential impact on asset useful life and increased management and maintenance as a result of increased extreme weather events. The Transport AMP notes the localised impacts of climate change on transport assets is noted to be unknown and remains a risk.

Council is working towards aligning asset management plan data and the asset data managed within Technology One. Asset condition data collected during condition assessments is being updated in the Technology One database to inform future renewal programs. An in-depth review of unit rates is undertaken during the 4 year valuation process. Council is working towards the development and regular updating of unit rates for all asset types across the five asset classes to accurately inform renewal costs.

The council staff indicated that although coastal assets are of interest, they are currently being addressed through other projects including the Coastal Adaptation Plan Phase 1 – Stocktake.

| Asset management feature | City of Holdfast Bay | |
|---|---|---|
| Asset classes | 1. Transport<br>2. Stormwater<br>3. Plant and Equipment<br>4. Buildings<br>5. Open Space and Coastal. | |
| Total asset value | $844 million | |
| Asset management team structure | Assets and Delivery<br>• Asset Management Team<br>○ *Asset Management Lead*<br>○ *GIS Specialist*<br>○ o Assets & Project Officer | |
| Asset management plan hierarchy | Asset management policy<br>Asset management plans | |
| Asset management system used | TechnologyOne | |
| Assetic predictor platform used | No | |
| GIS data system used | ESRI and SQL for Data Management, Intramaps for spatial data visualisation | |
| | Roads | 2015, 2019, 2020/21 |

| Asset management feature | City of Holdfast Bay | |
|---|---|---|
| Date of most recent condition assessments | Kerb and watertable | 2015/16 |
| | Bridges | 2019/20 |
| | Footpaths | 2019/20 |
| | Stormwater | 2021/22 consolidation of asset data (commencement of several year program to collect condition data) |
| | Open space / coastal assets | 2017/18 (majority of assets)<br>2018/19 – Glenelg Jetty<br>2019/20 – Coastal Entry Ramps<br>2020/21 – Edith Butler Pier Decking & Balustrades |
| | Buildings | 2018/19 |
| | Trees | 2021/22 (in progress) |
| | Other | |
| Asset condition assessment approach | All assets (excluding fleet) have a rolling 4 year conditional assessment and valuation going forward.<br><br>2021/22 - Building and Land, stormwater<br>2022/23 - Open Space, coastal<br>2023/24 – Roads, kerbs<br>2024/25 – Footpaths, other transport (car parks, bus stop infrastructure, bridges, lighting)<br><br>Plant & Equipment – replaced based on service life<br>Transport – Consultant provides a rolling 7 year road renewal program every 2 years, also provides kerb replacement length estimates. All transport assets on a 4 year condition assessment cycle. Upcoming audits for road and kerb 2024/25 and Footpath and other transport assets 2025/26.<br>Open Space/Coastal – Last condition audit undertaken in 2017/18, next audit 2022/23. Open space / costal assets assessed over several years through other drivers.<br>Playgrounds have quarterly internal Council inspections, annual Kidsafe audit and 4 year condition assessment.<br>Glenelg Jetty Public Safety assessment (structural assessment and fixtures) – 2018/19 | |

| Asset management feature | City of Holdfast Bay |
|---|---|
| | Stormwater – Undertaking council-wide stormwater pit audit over next 3 years and annual CCTV condition inspections of a selection of pipes.<br>Buildings – Condition assessment being undertaken in 2021/22. |
| Date of most recent asset management maturity assessment and approach used | None with current staff. |
| Whole of life emissions considerations | Being considered as part of Council's Operational Carbon Neutral Plan 2030 (in development) |
| Asset class priorities for RAMP | 1. Roads<br>2. Playgrounds<br>3. Stormwater |

### 3.5 City of Onkaparinga

The City of Onkaparinga's Strategic Asset Management Plan identifies 14 classes of asset. Responsibilities for these assets lies within the City Operations directorate.

The council has recently replaced their Corporate Asset Management Plan with the Strategic Asset Management Plan (SAMP) to provide a more concise and community facing document, The SAMP describes limiting factors that may impact the achievement of objectives (effectively describing issues relating to future demand). Service levels for all asset classes are defined in an attachment to the SAMP.

The scale of the City of Onkaparinga's assets means that condition assessments are a time and resource intense activity. Council staff indicated that the stormwater asset condition assessment took 2 years. It was noted that condition data for community assets was often basic where it does exist and data management is inconsistent. An assessment process for community assets is currently being developed.

| Asset management feature | City of Onkaparinga |
|---|---|
| Asset classes | 1. Roads (Sealed and Unsealed Roads, Kerbs, Pedestrian Refuges, Roundabouts and Guard Rails)<br>2. Bus shelters and pads<br>3. Buildings<br>4. Land<br>5. Play spaces (Playgrounds and Fitness Parks)<br>6. Lighting<br>7. Coastal assets (boardwalks, beach access stairs, coastal fencing, lookouts, vehicle ramps and structures like sand groynes, rock revetments and sand bag weirs)<br>8. Car parks<br>9. Parks<br>10. Bridges |

| Asset management feature | City of Onkaparinga | |
|---|---|---|
| | 11. Paths (Pathways and Kerb Ramps)<br>12. Water (Wastewater, Water Supply and Stormwater)<br>13. Sport and active recreation assets (ovals, courts, pitches, sports lighting and sports fencing)<br>14. Fleet and plant | |
| Total asset value | $2.9 billion | |
| Asset management team structure | City Operations – Community Assets, Infrastructure Asset Management, Technical Services | |
| Asset management plan hierarchy | Strategic Asset Management Plan<br>Individual asset management plans | |
| Asset management system used | Moving from Assetic Assets to Technology One - Enterprise Asset Management | |
| Assetic predictor platform used | Yes | |
| GIS data system used | ESRI ArcMap and Cloud products | |
| Date of most recent condition assessments | Roads | 2020<br>3 assessments complete over 12 years |
| | Bus shelters and pads | Inspected annually through maintenance |
| | Buildings | Not available |
| | Land | NA – not condition based |
| | Play spaces | Audit recently undertaken |
| | Lighting | Not available |
| | Coastal assets | Inspected through maintenance |
| | Car parks | 2018 |
| | Parks | Not available |
| | Bridges | 2015 |
| | Paths | 2019 |
| | Water and stormwater (inc CWMS, WWTP) | 2020 (inventory audit for stormwater) |
| | Sport and active recreation assets | Hard Court and Sport Lighting is currently being scoped. Completion due Feb 2022 |
| | Fleet and plant | NA – not condition based |
| Asset condition assessment approach | Asset condition assessments (Core asset management) are generally managed by the most appropriate team and planners within that team. Cyclical condition assessments for some asset classes. Ranging | |

| Asset management feature | City of Onkaparinga |
|---|---|
| | from 4-5 years. Some classes are inspected annually by operation and maintenance teams and capital works is programmed from this using Councils Project Capital Works (PCW) platform. Council is currently reviewing and developing an Asset Condition Assessment Schedule. |
| Date of most recent asset management maturity assessment and approach used | Not available |
| Whole of life emissions considerations | Not currently considered |
| Asset class priorities for RAMP | 1. Roads<br>2. Stormwater<br>3. Pathways<br>4. Coastal assets |

# 4. Climate change impacts and risks

## 4.1 Climate change impacts on council assets

Climate risks have direct and indirect physical impacts on council assets. Direct impacts of climate change will result from changes to the climate. Indirect impacts of climate change, such as changes to patterns of human settlement, development and land use may impact the future demands for assets.

The table below summarises the impacts and how they are likely to change as the climate changes.

***Table 2*** *Climate change impacts on council assets*

| Climate impact on assets | Potential impacts |
|---|---|
| Increased rates of deterioration, damage, or destruction of constructed assets. | Sealed roads and pavements require more frequent resurfacing as heat or inundation damages materials<br><br>Unsealed roads require more frequent grading as heavy rainfall events become more frequent<br><br>Buildings require more frequent painting or surface treatments as heat and rain increase deterioration<br><br>Building cooling requirements increase leading to increasing electricity costs as the climate warms<br><br>Building footings and condition reduce as warmer and drier conditions increase risk of soil heavage<br><br>Increasing risk of overflow from wastewater treatment ponds or septic tanks from heavy rainfall and flood events<br><br>Increased maintenance of outdoor recreation and playground facilities as temperatures and extreme heat events increase in frequency and intensity<br><br>Reducing functionality of Water Sensitive Urban Design (WSUD) features including wetlands and swales that rely on vegetation to filter and improve water quality<br><br>Stormwater assets reach capacity and fail during heavy rainfall events requiring increased maintenance, upgrading or rebuilding<br><br>Under-capacity stormwater infrastructure fails, increasing flood risk and associated risks to people and property<br><br>Sea walls and other coast protection measures fail as a result of increasing sea level and storm surge events<br><br>Buildings and coastal infrastructure such as coastal walking tracks, fences, sea walls and carparks require more frequent maintenance as sea levels rise and storm surge events become more frequent |

| Climate impact on assets | Potential impacts |
|---|---|
| | Damage to underground assets from rising groundwater or coastal inundation |
| Reduced quality and amenity of open space and natural assets | Reduced vegetation growth and vigour across streetscapes, parks and public realm as the climate warms and dries, with more frequent extreme heat events<br><br>Reduced condition of coastal parks and green space as more frequent inundation by salt water impacts turfed and planted areas<br><br>Open space and public realm require more water for increased irrigation during times of drought or extreme heat<br><br>Loss of biodiversity and amenity values associated with natural areas, wetlands and watercourses as rainfall reduces overall and high intensity rainfall events increase<br><br>Damage to street trees and shade structures from heavy rain, wind and hail<br><br>Changes in pest plant and animal distributions and abundance and emergence of new pest species<br><br>Damage and destruction of coastal dunes and wetlands, increasing risk of coastal erosion and flooding |
| Increasing road closures as a result of more frequent or intense flood or bushfire events | Increased disruption to transport and supply chains with potential impacts on business prosperity<br><br>Increasing risk to public health and safety during bushfires and floods |
| Increasing demand for council asset management and maintenance services as result of more frequent extreme weather events | Increasing demand for clean-up and removal of waste and debris following extreme weather, flooding and bushfire<br><br>Council work programs disrupted to respond and recover from extreme events, meaning scheduled works may be delayed or postponed and funding may be redistributed. |

## 4.2 Associated risks to councils

Climate related asset and infrastructure impacts have the potential to increase rates of deterioration and damage, increase demand for council services and increase disruption to essential services, requiring changes in guidelines, procedures and equipment and the way in which Councils' design, build and maintain their assets and infrastructure.

Many South Australian councils are already experiencing increases in costs associated with maintaining public realm, parks, reserves and sports and recreational facilities, along with increases in costs associated with the repair and replacement of assets and infrastructure, streetscapes and coastal assets after extreme storm events.

Asset and infrastructure related impacts and associated risks to councils that may increase as extreme weather and climate-related events increase in frequency and intensity are described in the following table:

| Asset or infrastructure impact | Associated risk to Councils |
|---|---|
| Increased rates of deterioration, damage or destruction of constructed assets and infrastructure | • Increased costs associated with building, operating and maintaining council assets and infrastructure<br>• Increased rates of asset depreciation with potential impacts on financial sustainability<br>• Increased liability to council if design, maintenance or repair processes do not consider climate risks<br>• Risks associated with not meeting agreed service levels<br>• Increased complaints to council as a result of damage or disruptions to council assets and infrastructure |
| Reduced quality and amenity of open space and natural assets | • Increased costs associated with maintenance and protection of open space<br>• Increased complaints to council as a result of deterioration of the public realm, open space or natural areas |
| Increased disruption to roads and essential services | • Increased disruption to essential services impacting council operations<br>• Local economic decline<br>• Increased risk to public health and safety |
| Increasing demand for council infrastructure services as result of more frequent extreme weather events | • Increasing demand for emergency management, in particular response and recovery<br>• Resources redirected to emergency response with potential impacts on programmed works<br>• Risks to financial sustainability |

# 5. Barriers to change

Through the discussions with council staff involved in asset management and recently published literature, a number of barriers to embedding climate risk in asset management have been identified including:

- Lack of clear and applicable direction or guidance from state and federal governments, the Local Government Association (LGA) or industry associations on how to assess and address climate risks.
- Lack of direction from above to consider climate change in asset management planning and processes, likely a result of a lack of understanding or quantified data regarding the potential scale of impacts and future costs to councils.
- Lack of clear direction and guidance in asset management plans.
- Responsibilities for asset management sitting across multiple council directorates.
- The large number of assets that councils own, the variation in type and value of these assets, the variability of their condition (meaning some are more resilient than others), variability of location (meaning some are exposed to more hazards than others) and interdependencies meaning that asset classes cannot be considered as a single unit and assumptions about risk in one location cannot be applied across the council area.
- Lack of quantitative data to support understanding of the extent of assets at risk, quantify associated costs including operational, maintenance, renewal, replacement or disposal costs.
- Lack of data and institutional support to support changing approaches to asset management that may cost more now but will have greater benefits in the future.
- No clear guidance on how to incorporate changing service levels or forecasts of future demand into asset management plans and quantitative analysis.
- Lack of recognition that existing service levels may not be able to be met in the future and different service levels may be required in different locations (for the same asset type).
- Rigid asset management systems (IT systems) that have not been established to include additional fields relating to known climate risks (eg exposure to flooding), multiple condition fields that can inform decision making,
- Lack of data and capacity to optimise use of existing tools (eg Predictor Platform).
- High costs associated with condition assessments that can be used to understand how assets perform under different conditions.
- Inconsistencies in council asset information systems.
- Inadequate council budgets for asset management – high costs of asset maintenance and renewals means little budget left for new projects or approaches.
- Many asset management processes and systems have been in place for many years, and are entrenched in business as usual
- A level of behaviour change is required for different approaches to be adopted.

# 6. Tools and approaches for assessing climate risks to assets

A range of tools and approaches for assessing climate risks to assets have been developed. In 2018 the Investor Group on Climate Change (IGCC) published a report summarising available tools and frameworks to manage physical climate risk[12]. In October 2021, the Asia Investor Group on Climate Change (AIGCC) published a similar report[13]. Indicated by the number of tools identified in these guides, there has been a rapid expansion in the tools available to assess climate risk.

The review of tools undertaken for this project focussed on options provided locally reflecting the importance of building council capacity through the RAMP.

An online literature review and phone interviews were undertaken to better understand how they could be applied to the RAMP, and a number of providers were approached with a request for information.

A preliminary three stage approach to the RAMP was documented, recognising that providers may be able to deliver some or all of the stages:

1. Assess the risk and vulnerability of council built and natural assets to climate change, for the four Resilient South Councils (Cities of Marion, Mitcham, Holdfast-Bay and Onkaparinga), recognising that the RAMP requires consideration of physical, social, financial, liability and other transition risks.
2. Identify options to address these risks and opportunities, including opportunities associated with asset design, construction and maintenance, asset management systems and software, other council policy and plans, council staff capacity and building community (included Elected Member) knowledge, awareness and support. Assess these options and develop an Asset Resilience Action Plan for each council.
3. Provide information to support investment decision making, for example through the development of a business case to fund asset resilience building.

## 6.1 Responses to request for information

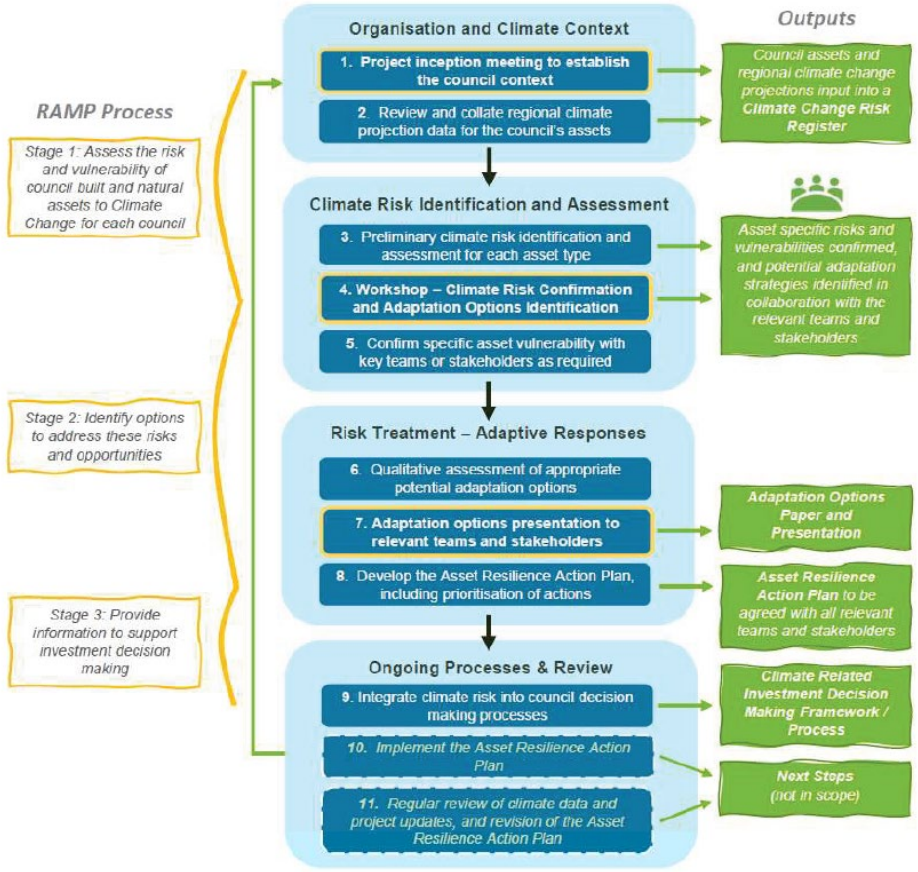
Several questions were asked of potential providers to better understand the capability of potential providers and how they might be able to meet the project's needs. A brief summary of each provider's response can be found in the tables below. More information can be provided on request to the Resilient South Regional Coordinator.

DISCLAIMER– The information provided below was current in October 2021. The approaches described may have been superseded as approaches are refined and new data becomes available. Councils should seek further information from providers before proceeding with any climate risk assessment.

[12] Investor Group on Climate Change (2018) *Investing in Resilience – Tools and frameworks for managing physical climate risk,* https://igcc.org.au/wp-content/uploads/2020/06/IGCC-Investing-in-Resilience-report_FINAL.pdf

[13] Investor Group on Climate Change (2021) *Riding the wave of physical risks A compendium of tools and service providers for investors in Asia*, https://www.aigcc.net/wp-content/uploads/2021/10/AIGCC_Riding-the-wave-of-physical-risks_2021_FINAL.pdf

### 6.1.1 Aurecon

| Question | Response |
|---|---|
| Which stage or stages could be delivered | • *All three stages (with potential for partnering with other organisations)* |
| Brief description of approach |  |
| Data or information needs | • *List of assets a council is responsible for, including type, location, size, age etc.*<br>• *Asset system drawings – where assets are spread over a large area (e.g. drainage systems)*<br>• *GIS data relating to the assets / areas where they are located*<br>• *Organisation structure*<br>• *Any previous assessments completed*<br>• *Key points of contact within the council*<br>• *Information on climate related damage, including from storms, flooding, temperature, wildfire etc, from the last five years.*<br>• *Existing climate control measures in place, (e.g. maintenance plans and policies, health and safety policies, design standards)*<br>• *Any flood modelling completed* |
| Cost range | *Can be provided to councils on request to the Resilient South Coordinator.* |

| Question | Response |
|---|---|
| Suggested variation or additions | • *When developing an Asset Resilience Action Plan, it is recommended that an 'adaptive pathways' assessment be conducted. 'Adaptive pathways' is a decision-making process for identifying assets where it may be appropriate to delay adaptation due to the frequency at which an asset is replaced or the uncertainty on the degree of adaptation required.*<br>• *Another option to consider is the development of a process to review asset maintenance regimes in line with climate risk. This could consider whether the frequency of inspections and maintenance or the types of maintenance solutions applied need to be revised in line with the impacts of climate change.* |
| Identified risks | • *Differing expectations and/or risk assessment and decision-making processes between councils / government agencies*<br>• *Differing levels of climate resilience capability between or within councils*<br>• *Challenges or delays receiving the required data and information.*<br>• *Workshops being under-attended or not attended by the required team members and stakeholders.*<br>• *If the 'so what' context is not incorporated, then the stakeholders do not engage to the depth required to unpack complex risks, build trust, and enable adaptive capacity.*<br>• *Covid restrictions may require the workshops to be done virtually, which could potentially decrease engagement. However, we have online workshop tools available, and are experienced in running virtual workshops effectively.* |

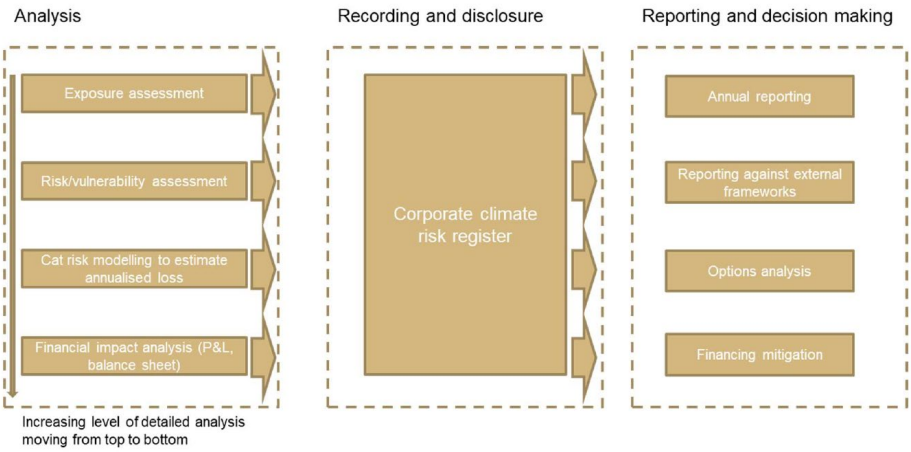
### 6.1.2 CSIRO

| Question | Response |
|---|---|
| Which stage or stages could be delivered | • *The University of Adelaide, Value Advisory Partners (VAP) and CSIRO will collaborate to undertake and deliver all three stages* |
| Brief description of approach | • *Our approach will be underpinned by an enhanced version of the Enabling Resilience Investment approach (developed by CSIRO and VAP) and will incorporate the capabilities and practices of the UNHaRMED system* [see also Section 6.2.1]*, designed by the University of Adelaide) to risk and mitigation planning.*<br>• *Our combined approach will provide an integrated approach to information to support investment decision making with consideration of physical, social, financial, liability and other transition risks.*<br>• *We will also use an adaptive staged approach, underpinned by monitoring, evaluation and learning.* |
| Data or information needs | *Substantial data is already available or will be available through the University of Adelaide's current UNHaRMED work and the new Australian Climate Service (ACS) through the ABS,*<br>Some of the current data requirements we will look to include (but are not limited to): |

| Question | Response |
|---|---|
| | • *metrics: historical and forecasts*<br>• *climate & future precinct change layer*<br>• *hazard exposure and vulnerability assessment*<br>• *disaster risk reduction, resilience & recovery layer*<br>• *climate adaptation & mitigation layer*<br>• *integrated opportunity assessment*<br>*Data required can also come from our stakeholder workshops, meaning that the results will be localised and specific* |
| Cost range | • *Costs are difficult to ascertain at this stage.*<br>• *Partners will evaluate the proportion of the work program that can be undertaken 'in kind' or as part of the Australian Climate Service program to assist with the allocated budget.* |
| Suggested variation or additions | • *It will be worthwhile to review the three stage approach with the Enabling Resilience Investment Guidance, which details specific areas of change for each step in developing resilient investments.* |
| Identified risks | • *Lack of buy in/ support from the critical stakeholders across all councils*<br>• *Misalignment around the strategic intent around asset management and the kinds of opportunities needing to be pursued for catalysing investment.*<br>• *The approach is seen as being too high level if stakeholders have not aligned with the systemic nature of the problem and the need to revisit the values/priorities and objectives for the region*<br>• *The analysis is too high level and does not address the specific asset and infrastructure requirements for all the councils in the Resilient South team, and the specific needs within each of the Resilient South councils.* |

### 6.1.3 Edge Environment

| Question | Response |
|---|---|
| Which stage or stages could be delivered | • *All three stages (with potential for partnering with other organisations)* |

| Question | Response |
|---|---|
| Brief description of approach |  |
| Data or information needs | • *Selection of climate change scenarios, noting State Government and CMSI recommendation for analyses based on RCP8.5*<br>• *Locations of assets*<br>• *Value of assets*<br>• *Design life*<br>• *Council specific risk assessment framework including categorisation of financial risks.* |
| Cost range | *The costs will depend on the level of detail required at each stage and the purpose of the analysis.*<br>• *ISO31000 aligned climate risk assessments at a whole of portfolio scale will cost $20-$30,000 (phase 1), with an additional $10-$20,000 to undertake low level options analysis.*<br>• *More detailed modelling approaches including catastrophe risk modelling and development of damage curves is more likely to be in the range of $100-$200,000.*<br>• *Business case development costs can vary significantly. Typically this would be in the range of $50-$100,000 for financing and funding requests for projects valued over $5million, and potentially much greater as the size of investment increases.*<br>*NOTE - Due to private sector demand for climate risk assessment, councils should expect the prices for this type of work to have gone up at least another 20%. This doesn't account for inflationary pressures that will also impact pricing over the next 12-24 months* |
| Suggested variation or additions | • *Scope refinement needs to recognise the different techniques applicable to the types of risks identified in the EOI, for example physical risks, transition risk and social risks.*<br>• *Consider online climate risk assessment platform that allow dynamic and responsive climate risk reporting.* |
| Identified risks | • *Lack of clarity on scope and misalignment of proposed methods with desired deliverables.* |

| Question | Response |
|---|---|
| | • *Because we believe that there is more than one solution required to address the broad scope articulated in the ROI, the ability to integrate outputs from multiple methods.*<br>• *Lack of clarity on the ability for different approaches to deliver all or multiple outcomes.* |

### 6.1.4 Spatial Vision

| Question | Response |
|---|---|
| Which stage or stages could be delivered | • *All Stages – but primarily Stage1.*<br>• *For Stages 2 and 3 we would propose partnering with economic and financial specialists with who we have previously worked with on similar studies and undertake dedicated scenario-based case studies (on event types and impacted assets).* |
| Brief description of approach | *<u>Phase 1 – Data Access and Collation, Project Definitions and Framework</u>*<br>*The key focus of Phase 1 is to ensure all key decisions and definitions have been made and agreed data collated to undertake an Impact and Vulnerability Assessment.*<br>*Data capture and collation includes the development of a range of spatial datasets in a suitable format for each of the councils. This will be done over three main themes including;*<br>• *Council Asset data,*<br>• *Climate Change Projections and related event data, and*<br>• *Observed Past Events.*<br>*From these collated and cleaned databases, a modelling framework relevant for the project study region will be detailed on which to assess asset vulnerability to climate change variables. Although the Spatial Vision team does make use of a high-level framework for the undertaking of this type of analysis, it is only through the understanding of the data at hand which will shape how it will be applied for a region or project area.*<br>*The supplied data helps tailor the framework for a Council area creating an almost bespoke solution. Also, by working with a Council it helps facilitate understanding in both directions between Council and project team. It creates a framework that is open and interpretable by clients. This allows for repeatability if and when they choose to update or rerun the process themselves.*<br><br>*<u>Phase 2 – Climate Change Vulnerability Assessment and associated Extreme Weather Impacts</u>*<br>*The second phase is centred on the processing and analysis of the vulnerability assessment for each asset. This first pass assessment is done as a region wide assessment incorporating all available asset data to output a vulnerability rating for* |

| Question | Response |
|---|---|
| | *each asset, where applicable. This does depend on availability of data and appropriateness for use.*<br>*Outputs to this vulnerability assessment are a series of ratings for each selected asset for a range of exposures. This will be to a range of climate scenarios for likely climate futures and key future timepoints as identified.*<br>*Another key output is the explorations of more direct hazards that are related to climate change events, such as costal inundation and overland flooding. This is usually done as a side to the vulnerability assessment and looks at overlays these hazards may have with council assets and the level of impact they may have at differing scenario points and timeframes.*<br>*An output of this assessment is a series of asset profiles that can detail how much an asset is impacted by particular hazards. Depending on the level of detail scoped from input data can shape how this analysis and profiles are provided.*<br><br>*<u>Phase 3 – Vulnerability and Impact Mentoring and Support</u>*<br>*The last phase is centred on the delivery of the final outputs back to client. A main focus of a project is to create a database of information containing the above results, with associated reports. But a lot of the communication and understanding of the outputs can be lost without proper handover.*<br>*A key to this is to facilitate a series of mentoring workshops in which the input climate and asset data is run through, with each individual council, as well as the output vulnerability findings. The climate data and communication of such, is seen as an integral phase in the understanding of the outputs. Concepts of scenario setting and lines of investigation are typically explored through a lens of potential use cases or case studies.*<br>*All data is typically presented in a range of mapping solutions. Static mapping is a default and is usually output throughout the course of a project. Web mapping and interactive visualisations are other options that can be explored. But these often only present a cursory level of understanding and lack the depth of analysis that is sometimes required.*<br>*A suggested solution offered by Spatial Vision is the creation of a custom desktop package, usually using open source solutions such as QGIS, that presents all relevant data back to a client in a logical and consistent manner. The client can then be armed with the knowledge and data to run their own analyses. This desktop GIS suite of solutions is often teamed with training in these packages.* |
| Data or information needs | • *Spatial depiction of council assets*<br>• *Relevant asset attributes that assist with an understanding of sensitivity and inherent resilience (such as asset condition) to climate change parameters.*<br>• *Climate data inputs prepared by CSIRO as an outcome to the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5).* |

| Question | Response |
|---|---|
| | • *Based on previous climate studies we also see value in using existing climate observation data to help understand and communicate how we are already experiencing changes in the climate. This observational data can also be teamed with recorded extreme historical weather events, such as heat waves or flooding events.* |
| Cost range | • *Phase 1: $ 20,000 – 40,000*<br>• *Phase 2: $ 40,000 - $80,000*<br>• *Phase 3: $30,000 - $50,000* |
| Suggested variation or additions | • *We would recommend targeted case studies on climate event types (eg. heatwaves, or inundation scenarios), for a focus area (possibly passed on previous events, be undertaken. These would build on the region- wide assessment.* |
| Identified risks | • *Insufficient or inadequate data.* |

### 6.1.5 XDI

| Question | Response |
|---|---|
| Which stage or stages could be delivered | • *XDI's engineering grade physical risk assessment can be applied to stage 1, 2 and 3* |
| Brief description of approach | • *Receive from RAMP a dataset of dwellings / buildings and locations of interest, and polygon shape file and boundary locations of the open spaces that require analysis.*<br>• *Enter all major data into Climate Risk Engines for address level analysis across each of the council areas.*<br>• *Run a physical risk assessment under RCP8.5 for each of the council's built assets to identify locations and assets at risk.*<br>• *Run climate hazard analysis on natural assets to identify the severities of each climate hazard that may affect those areas.*<br>• *Using XDI Globe, determine highest risk assets or areas for deeper analysis with other tools.*<br>• *For properties identified as being of high climate risk and of particular interest to each council, customise asset details to reflect their physical reality most closely. Then determine the specific hazards and construction componentry contributing to each individual asset's risk profile and level of resilience over time.*<br>• *Utilising Adapt XDI run cost benefit analysis for different adaptation pathways to inform a suitable pathway for risk mitigation and future resilience.* |
| Data or information needs | • *Location of each built asset*<br>• *Asset details such as building type, year of build, replacement value and any existing climate risk adaption measures that have been taken. If this information is not readily available XDI can use default values with the approval of the 4 Resilient South Councils.* |

| Question | Response |
|---|---|
| | • *Shape files of the natural areas that require analysis with details of their locations and boundaries.* |
| Cost range | *Costs are dependent upon volume and type of analysis required for each asset and/or location and also the metrics and outputs provided.*<br>• *Step 1: Run portfolio overview assessment at RCP 8.5 of each of the physical assets.*<br>– *Cost $13 per asset*<br>• *Step 2: Obtain detailed asset level information for those assets that were identified as high risk in the initial portfolio overview assessment.*<br>– *Cost $124 per asset*<br>• *Step 3: Select the assets that would benefit from even more detailed analysis. Run either a Single Site Analysis, Large Site Analysis or Linear Analysis on each of those assets.*<br>– *Cost $1240 per Single Site*<br>– *Cost $4820 per Large Site/Linear Site Analysis*<br>• *Step 4: Run a climate adjusted hazard analysis on the natural areas of interest with no physical assets. If these areas have the potential to be developed in the future we can place archetypes on the site to show the likely impacts of climate change over time on future assets.*<br>– *Cost – To be discussed dependent upon area, hazard and required resolution.*<br>• *Then a subsequent more detailed analysis would be applied to those assets that risk was identified.* |
| Suggested variation or additions | • *None* |
| Identified risks | • *Management of logistics and communication between multiple parties involved in the project ensuring timely delivery of results.* |

#### 6.1.6 Forty2 Science

Forty2Science provided a response to the request for information however requested this information not be shared.

## 6.2 Other approaches

A number of other approaches associated with or separate to the responses provided in Section 6.1 are identified below.

### 6.2.1 UNHaRMED

UNHaRMED (Unified Natural Hazard Risk Mitigation Exploratory Decision system) is a decision support software developed by the University of Adelaide and the Research Institute for Knowledge Systems[14]. It takes into account future changes in demographics, land use, economics and climate. The modelling tool analyses areas of risk both now and into the future, tests risk reduction options, identifies mitigation portfolios that provide the best outcomes for a given budget, and consider single or multiple types of risk reduction options, such as land use planning, structural measures and community education.

By producing estimates on future exposures, and using damage curves and a variety of other policy metrics in a spatial and temporal format, UNHaRMED can assess the effectiveness of a range of risk mitigation options and enable a cost benefit analysis for each of the different risk mitigation options.

This software was trialled to explore future coastal inundation risk at the City of Port Adelaide Enfield. This trial identified potential future losses from inundation and assessed the effectiveness of different mitigation strategies including changing building floor levels, structural measures such as sea walls and land use planning mechanisms. The case study in 6.6.2 provides more information on this project.

### 6.2.2 RAPTA

The Resilience, Adaptation Pathways and Transformation Approach (RAPTA)[15] was developed by the CSIRO to design, implement and evaluate interventions for achieving sustainability goals within highly uncertain and rapidly changing decision contexts.

RAPTA consists of three modules:

1. People – identify stakeholders, their roles and connections to bring them together to set goals and a vision for future change
2. Systems analysis – describe and analyse the system considering environmental, social and economic aspects to understand and assess the resilience of the system to cope with risks and shocks
3. Options and pathways to action – identify and assess options for building resilience and build sequencing pathways to inform implementation.

In recent years, the approach identified in RAPTA has been further developed to form part of the Enabling Resilience Investment (ERI) Assessment approaches with CSIRO and VAP (see 6.1.2).

### 6.2.3 Geoneon

Geoneon is a Tasmanian based consulting company that has developed an approach to assess the spatial vulnerability of assets to natural disasters on a regional scale now and into the future. Geoneon has been working with the City of Hobart to develop an infrastructure model including economic and social metrics, eighteen asset types and multiple hazard types.

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[14] Delden et al (2019) Unharmed Framework Report, https://www.bnhcrc.com.au/sites/default/files/managed/downloads/unharmed_framework_report.pdf

[15] CSIRO (2019) Resilience Adaptation Pathways and Transformation Approach, https://acfid.asn.au/sites/site.acfid/files/19-00418_LW_REPORT_RAPTAGuide_WEB_190829.pdf

### 6.2.4 Climate Compass

Climate Compass is a three-cycle approach to identify and manage risks posed by climate change. It was designed for Commonwealth Agencies by the CSIRO[16] but could be applied by any government or organisation. The three cycles reflect increasing detail required:

1. Scan – provides a high-level identification of climate risks and can be used to prioritise further investigation.
2. Strategy – involves a deeper level of risk identification, assessment and treatment. Designed to assess the work of a particular team, policy, program or objective.
3. Project – involves a detailed assessment and operational plan for a focussed area of work.

The Project cycle approach follows a 6-step assessment approach; scoping, scenario construction, risk identification, action prioritisation, planning and evaluation. This approach is similar to that proposed for the first two stages of work proposed for the RAMP.

### 6.2.5 Climate Risk Ready NSW Guide

The Climate Risk Ready NSW Guide[17] provides practical guidance for the NSW Government sector to assess and manage climate change risks. The approach follows standard risk management processes:

1. Step 1. Establish the context. Understand organisational climate risk management maturity [see also Section 3.1], identify stakeholders and determine the scope.
2. Step 2. Identify, analyse and evaluate the risk. Understand past and recent climate hazards, climate projections, identify, analyse and evaluate risks and opportunities.
3. Step 3. Identify and plan risk treatments. Develop an adaptation plan to treat priority climate change risks and increase climate change risk maturity
4. Step 4. Monitor and review.

The approach described in the Guide follows a similar approach to the first two stages of work proposed for the RAMP.

### 6.2.6 Climate Risk Management – A Guide for Local Government Engineers and Asset Managers in South Australia

The Climate Risk Management Guide was prepared in 2017 by the Local Government Association of South Australia and provides information for engineers and asset managers on the following:

- *Why do local government engineers and asset managers need to consider climate risk?*
- *How is the climate changing in South Australia?*
- *What does this mean for councils?*

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[16] CSIRO (2018). Climate Compass: A climate risk management framework for Commonwealth agencies, https://www.awe.gov.au/sites/default/files/documents/climate-compass-climate-risk-management-framework-commonwealth-agencies.pdf

[17] NSW Government (2020) Climate Risk Ready NSW Guide https://climatechange.environment.nsw.gov.au/adapting-to-climate-change/climate-risk-ready-nsw

- *What are council's responsibilities for climate risk management?*
- *What do we need to do as local government engineers and asset managers?*
- *What are the benefits of managing climate risk?*

The guide describes a number of recommendations for councils to embed climate risk in asset management plans, considerations for new and existing assets and links to other council strategies, policies and plans. It provides a useful introduction that would be of use to all council engineers and asset managers.

## 6.3 Infrastructure sustainability ratings

The Infrastructure Sustainability Council of Australia (ISCA) has developed the Infrastructure Sustainability (IS) Rating Scheme to evaluate the economic, social and environmental performance of infrastructure across the planning, design, construction and operational phases of infrastructure assets[18]. It can be applied to assess the performance of infrastructure at an individual asset level, for portfolios or networks, or at a regional scale.

The IS Rating is designed to support the development and operation of more sustainable infrastructure in Australia. Credits are available across a number of themes including context (urban and landscape design context), resilience, climate and natural hazards, energy and carbon reduction, renewable energy, green infrastructure, water quality and use, ecological impacts and heritage.

A cost benefit analysis of the Infrastructure Sustainability (IS) Rating Scheme completed in March 2020 conservatively found that IS Ratings are projected to deliver a minimum of $1.6 in benefit for every $1 of cost over the period 2020-2040, and potentially up to $2.4 in benefit for every $1 of cost[19].

This tool has been used by the Department for Infrastructure and Transport (DIT) on a number of major projects. The *Master Specification PC-ST1 Sustainability in Design* applies to all work delivered by external parties and contracted by DIT and require a contractor either achieves an Infrastructure Sustainability certification, as certified by the ISCA, or specifies relevant sustainability requirements of the master specification.

The IS Rating Scheme could be of use to larger future capital projects (>$2m) for the councils however the cost of undertaking the rating means it is unlikely to be feasible for smaller projects.

It is recommended that Phase 2 of the RAMP investigate options for evaluating or rating smaller capital projects for climate resilience. This may also include consideration of embodied carbon (see below).

## 6.4 Embodied carbon

As councils seek to reduce their greenhouse gas emissions and progress net zero goals, all services and functions of council will be seeking opportunities to reduce emissions.

The embodied carbon is the total greenhouse gas emissions released through all stages of the asset life cycle, from raw material extraction, transport, construction and maintenance to end of life.

[18] https://www.iscouncil.org/is-ratings/

[19] RPS (2020) *IS Rating Scheme Return On Investment,* https://g0x0d22cr7g33gkzplucvu39-wpengine.netdna-ssl.com/wp-content/uploads/2021/10/19187-IS-Rating-ROI-Final-R2.pdf

There are various methods and tools available to calculate the embodied carbon. The increasing availability of Environmental Product Declarations (EPDs) means asset managers can compare material choices even if they do not undertake a complete life cycle assessment.

As new council assets are required to meet new or changing demands, asset managers will need to understand and demonstrate their sustainability and resilience credentials and use this to inform decisions.

Phase Two of the RAMP should include identifying how new capital projects will be evaluated including considering their embodied carbon.

## 6.5 Data and information sources

The key data and information sources that will be required for the proposed pilot project will include asset data (type, location, condition and other characteristics) and climate data (including projections and hazard data). Asset information has been described in Section 3. The following sections describe climate data. Where possible, hazard data that is consistent across the four councils will be preferable.

### 6.5.1 Climate projections

The *Guide to Climate Projections for Risk Assessment and Planning in South Australia*[20] *summarises projections* collated from two sources, which provide climate projections coverage for the whole of South Australia:

1. Climate Change in Australia (CSIRO and Bureau of Meteorology) and

2. SA Climate Ready (CSIRO and Goyder Institute for Water Research).

These projections are based on simulations from CMIP5 global climate model simulations. (CMIP5 is the model ensemble for the IPCC's Fifth Assessment Report (AR5) and was released in 2014).

The South Australian Government has joined the New South Wales and Australian Capital Territory Regional Climate Modelling (NARCliM) project to deliver high-resolution climate change projections.

In mid-2022 downscaled data using the current generation NARCliM 1.5 from CMIP5 models will be released for South Australia.

In early 2023, the next generation of NARCliM projections will be released with a resolution of just 4 kilometres. These will use the CMIP6 model ensemble (from the IPCC's Sixth Assessment Report (AR6) released in 2021).

### 6.5.2 Flood hazard data

In addition to existing flood data held by the councils, the Attorney-General's Department and the State Planning Commission are currently undertaking a Flood Hazard Mapping Project.

Regional scale flood hazard mapping has been purchased from two vendors and is currently being prepared for inclusion in the Planning and Design Code and for delivery through SAPPA.

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[20] Green G and Pannell A (2020). *Guide to Climate Projections for Risk Assessment and Planning in South Australia*, https://data.environment.sa.gov.au/Content/Publications/Guide%20to%20climate%20change%20projections%20for%20risk%20assmt%20and%20planning%20in%20SA.pdf

Nine new flood studies are being prepared predominantly by South Australian suppliers, with twenty-five existing flood studies also being enhanced to build on existing work by councils and SA Water. Both the new and enhanced flood hazard studies are being developed to address the impact of climate change and future development growth to 2050.

### 6.5.3 Bushfire hazard

To support the Statewide Bushfire Hazards Overlay Code Amendment initiated by the State Planning Commission, bushfire risk spatial data has been refined using new and improved evidence including more current vegetation data, recent grassfire modelling that reflects agricultural land uses and amended forest modelling.

The *Proposal to Initiate an Amendment to the Planning & Design Code*[21] states that further investigations are proposed as part of this project to apply further predictive modelling to determine which areas may, if any, be subject to potential increases in hazard risk due to extreme weather events (intensity and frequency).

### 6.5.4 Extreme heat hazard

The Resilient South councils first used thermal infrared imagery to measure the land surface temperature of urban areas on a 39.5°C day in 2016. This allowed the identification of hot spots where temperatures are higher. It is planned to repeat the image capture to provide heat mapping across the entire metropolitan area in 2022-23.

## 6.6 Case studies

### 6.6.1 SECCA Asset Vulnerability Assessment (Spatial Vision)

The Asset Vulnerability Assessment (AVA) project has recently been completed by Spatial Vison for the South East Councils Climate Change Alliance (SECCCA). This assessment was undertaken to support the 9 partner councils demonstrate how council buildings, drainage and local road assets will be impacted by various climate scenarios. Two emissions scenarios and 3 climate models were used.

A vulnerability rating was applied to all assets and adaptation actions that may increase asset resilience identified. The project examined how climate change will impact expenditure and income on council assets through calculating the cost of mitigation actions, the cost of inaction (ie expectations of higher insurance premiums and maintenance and repair costs) identifying how service delivery may have to change to adapt to future climate extremes and how income generating actions may be impacted (eg leasing of premises, rates reduction in line with property values).

Financial impacts were identified at a broad level across the region. To understand the detail cost implications on particular assets, 3 case studies were assessed in greater detail including stormwater outfalls to Port Phillip Bay. A publicly available data platform has been prepared to share results.

[21] State Planning Commission (2021) *Proposal to Initiate an Amendment to the Planning & Design Code,* https://plan.sa.gov.au/__data/assets/pdf_file/0005/848606/Statewide_Bushfire_Hazards_Overlay_Code_Amendment_-_Proposal_to_Initiate.pdf

Feedback from the client group noted that Spatial Vision were good to work with, being flexible and adaptive when asset data was incomplete. Their work with the individual councils to build capacity to understand and use the output data in the future was noted to be particularly strong.

### 6.6.2 Port Adelaide coastal adaptation (Adelaide University, CSIRO, VAP)

The Port Adelaide coastal adaptation project started with the Port Adelaide Seawater and Stormwater Flooding Study in 2005 which identified the need for planning controls and physical mitigation options. A number of further studies were undertaken investing options for seawall construction (2013) and impacts on a wider area of Western Adelaide (2017).

Using the information developed through these studies, the UNHaRMED approach was trialled to explored the ways in which the likelihood and consequence of coastal inundation risk at the port could change in future decades including identifying future damage losses arising from projected sea level rise and identifying the effectiveness of a range of risk mitigation options. Workshops with council staff and key stakeholders including state government agencies were undertaken to inform this. Information

The City of Port Adelaide Enfield is now working with the CSIRO and VAP using the Enabling Resilience Investment (ERI) framework to test the ERI methodology. This work will focus on identifying the beneficiaries of risk mitigation action, calculate the value creation if the action is implemented and identifying funding mechanisms and investment pathways. Information developed to date has been used.

Feedback from the client group noted the great work done by CSIRO (Russ Wise) and VAP (Nic Mesic) on this project and their considerable investment in seeing the project delivered. It was noted that clear and regular communication between the client and consultant project managers is essential for project success.

# 7. Recommendations for the RAMP

Using the information gained through the research summarised in this report, a proposed approach to be delivered through a five-phase pilot project has been documented below to inform the development of a project brief.

**Phase one: Scoping and visioning** - Communicate the project scope and agree on a vision for a resilient future

**Phase two: Assess asset risk and vulnerability** - Assess the risk and vulnerability of council built and natural assets to climate change.

**Phase three – identify and assess options to address risks and opportunities** - Identify and assess options to address identified risks and prepare an Asset Resilience Action Plan for each council and the region.

**Phase four – support for resilience investment** Develop information for each council that will support resilience investment

**Phase five – sharing the findings** - Share the outcomes of the RAMP project with Resilient South and other South Australia councils

In addition, to support evaluation of the RAMP it is recommended that an investigation to develop an approach to assessing climate resilience as part of asset management maturity be undertaken.

**NOTE – This approach has been further developed and refined through subsequent project processes and is not the final approach to be implemented in the pilot project.**

## 7.1 Asset maturity – climate resilience considerations

| | |
|---|---|
| **Objective** | Develop a framework for assessing climate resilience in asset management through an approach consistent with the NAMS+ asset maturity assessment framework. |
| **Key tasks** | 1. Workshop with council asset managers and partners to scope approach and key considerations to be included in framework<br>2. Develop framework<br>3. Test framework with Resilient South councils<br>4. Report on approach and seek opportunities to share with other councils |
| **Considerations** | • Refer discussion in section 3.1.<br>• Reference recommendations of IPWEA Practice Notes 12.1 and 12.2<br>• Review application of parts of the NSW Government Climate Risk Maturity Health Check Tool<br>• Align approach with climate adaptation governance assessments where relevant and of benefit, particularly in relation to organisational policies. |

| | |
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| **Potential partners** | IPWEA - Dr Jacqueline Balston, Steve Verity<br>Donovan Burton<br>Dr Theuns Henning |

## 7.2 Phase one - scoping and visioning

The first phase of the pilot project is proposed to ensure all council participants in the RAMP start on the journey together. Although a number of council asset managers and engineers have been involved with the RAMP from its inception, it is important that everyone has a shared understanding of why the project is being undertaken.

It is well understood that building resilience required embedding it in all decisions which is likely to require personal, structural and cultural change. This phase will be beneficial in informing options to support any required changes.

| | |
|---|---|
| **Objective** | Communicate the project scope and agree on a vision for a resilient future |
| **Key tasks** | 1. Identify council stakeholders that will be involved through the RAMP<br>2. Communicate project scope and approach<br>3. Develop a shared vision for a resilient southern Adelaide |
| **Considerations** | • May use Theory of Change model – how and why a desired change is expected to happen in the RAMP context<br>• Need to identify what type of scenarios will be used in future phases based on vision for future. Eg scenarios based on risk tolerance, future climate and at different times/years. Need to limit number of scenarios to and make sure all are plausible futures to help manage costs |

## 7.3 Phase two – assess asset risk and vulnerability

The second phase of work focuses on assessing the risk and vulnerability of selected council assets. This requires assessing physical risks as well as social, financial, liability and other transition risks.

| | |
|---|---|
| **Objective** | Assess the risk and vulnerability of council built and natural assets to climate change. |
| **Key tasks** | 1. Assess physical risks to asset through approach that utilises spatial analysis, considering multiple scenarios relating to time scale (eg 2050 and 2090) and/or emissions scenarios |

| | |
|---|---|
| | 2. Assess other risks to assets (eg liability, financial, transition risks) through an approach that considers current policy, management systems, knowledge and capacity |
| **Considerations** | • Multiple climate scenarios to be assessed – to be agreed with Steering Committee<br>• Selected asset classes will be identified, ideally with two asset classes per councils selected (depending on the costs provided to do this). Ideally have one asset class consistent across all four councils. Other classes may be selected for one or more other councils. Alternately may select location/area and assess risks to all assets in that locality.<br>• Proposed asset classes are identified in section 3. Discussions with councils indicated further consideration is required before these are signed off, including consideration of long and short life assets.<br>• Physical risks to assets will require spatial asset data and hazard data and will consider all hazards.<br>• Hazard data (eg flood extent, coastal hazards, bushfire hazard) may be variable across the councils and not all includes climate change influences (eg older flood data). Recently developed data will be sought from AGD-PLUS.<br>• Spatial outputs need to be compatible with council GIS systems (Esri)<br>• Each council stores asset data in different systems<br>• Availability of condition data varies between asset classes and councils<br>• Where data is not available, assumptions on default values may be required<br>• Other risks require consideration of the broader council "system" in which the assets exist, and the benefits to the community and economy that the assets provide<br>• Risks associated with potential future/new assets may require review of current guidance for asset design which may differ between councils. |

## 7.4 Phase three – identify and assess options to address risks and opportunities

Phase three of the pilot project will identify options to address the risks and opportunities identified in phase two to inform the development of an Action Plan for each council and for the region.

| | |
|---|---|
| **Objective** | Identify and assess options to address identified risks and prepare an Asset Resilience Action Plan for each council. |
| **Key tasks** | 1. Identify and develop costings for options to address risks and opportunities<br>2. Assess options to build asset resilience, including calculation of value creation, community benefits and mitigated risk |

| | |
|---|---|
| | 3. Prioritise options for action, considering social, economic and environmental benefits<br>4. Use findings from 3 to inform the identification of a preferred program of work/pathway to be assessed in phase 4<br>5. Identify options for policy and system improvement that can contribute to mitigating risks to assets<br>6. Develop an Asset Resilience Action Plan (may be up to 20 years ie two cycles of Long Term Financial Plan) for each council that describes the preferred program/pathway |
| **Considerations** | • Options may include recommendations for strategic council policy (ie outside the asset management policy or strategy) that provides guidance, and how council can reduce liability risks by improving policy or governance<br>• Options may relate to asset design, construction, maintenance and end of life<br>• Options may refer to improving asset management plans to better guide asset designers and managers, assist in defining appropriate services levels, calculating future demand and provide quantitative future cost data<br>• Identify opportunities to provide data to input to Predictor Platform, including liaise with Assetic *(*developed of Predictor Platform)<br>• Variations in council asset management systems and software need to be incorporated<br>• Need to consider council staff capacity and building community (included Elected Member) knowledge, awareness and support<br>• Investigate options for assessing or rating smaller capital projects for climate resilience<br>• Identifying how new capital projects will be evaluated including considering their embodied carbon through use of standard approach, to be investigated and recommended through task<br>• Assessment needs to consider the value creation of the options, associated community benefits and beneficiaries<br>• Assessment needs to identify the benefits of mitigated disaster and financial risks that will result from the implementation<br>• Phase 3 will deliver a programs of work or pathways for implementation that will be assessed further in phase 4<br>• Following development of program, some further evaluation may be required to understand how the costs and benefits vary if assessed against different scenarios (eg difference in action required to mitigate risks to an acceptable level given a low council risk tolerance or a high council risk tolerance, ie two scenarios where the level of acceptable risk is different) |

## 7.5 Phase four – support for resilience investment

Even when risk mitigation and adaptation options have been identified and prioritised, experience across Australia has shown that obtaining funding or investment to deliver these options can be difficult.

Phase four of the pilot project is designed to meet this challenge. The tasks undertaken during this phase will provide information to support investment decision making.

| | |
|---|---|
| **Objective** | Develop information for each council that will support resilience investment |
| **Key tasks** | 1. Confirm the benefits of the program of works/pathway identified in phase three<br>2. Test the variables that affect the measures of value against different scenarios (time, risk acceptability etc)<br>3. Identify potential funding sources for resilience investment<br>4. Provide a package of information to support the development of a business case resilience investment (eg if investment is sought for one or more options)<br>a. What action is needed?<br>b. What will it cost?<br>c. What are the benefits?<br>d. What are the risks if we do not act?<br>e. Where can funding be sourced? |
| **Considerations** | • Engagement with councils will be critical to ensure this phase creates the outputs that will support them in their business case development. |

## 7.6 Phase five – sharing the findings

Sharing the findings and learnings from the pilot project is a key component of the RAMP. A report and case study will be prepared that describes the outcomes of the pilot actions and their broader application for councils across South Australia.

Training or engagement materials will also be prepared to support capacity building both within and beyond the Resilient South councils.

| | |
|---|---|
| **Objective** | Share the outcomes of the RAMP project with Resilient South and other South Australia councils |
| **Key tasks** | 1. Develop summary report of whole RAMP project and short case study<br>2. Develop materials to support capacity building<br>3. Facilitate workshop to share findings. |
| **Considerations** | • Cover whole RAMP process |

| | |
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| | • Recognise that not all councils are well resourced and may not be able to implement the entire process developed by RAMP |

## 7.7 Enabling Resilient Investment

The CSIRO and Value Advisory Partners (VAP) have developed the Enabling Resilient Investment (ERI) approach to address gaps (systems based and value creation) in the economic assessment of resilient investment cases, and to support resilience investments at all levels of government and private industry.

The ERI approach builds on the RAPTA process (see section 6.2.2) and was proposed by CSIRO in their submission to the request for information (see section 6.1.2).

The approach includes 8 modules

1. People, values &visions
2. Systems analysis
3. Identify high-level options and pathways
4. Expanding options &scoping value creation opportunities
5. Assessing the value potential and value at risk
6. Shaping and prioritising investment cases
7. Financial risk alignment and validation
8. Producing revenue streams for funding and financing

The ERI Delivery partners (CSIRO and VAP) have recently been awarded funding from CSIRO to pilot their approach on a number of regions. Discussions with the CSIRO and VAP have indicated that the RAMP is a preferred project for a pilot project.

It is proposed that the pilot project addresses some of the tasks identified in phases three and all of phase four of the proposed approach which would align with modules 4 to 8.

Further discussions with CSIRO and VAP are required to clarify the extent of their work and contribution of the pilot project to these tasks.