

Chapter 24

Climate Change Adaptation Planning with Peri-Urban Local Government in Victoria, Australia

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Abstract Climate change presents many challenges for local government in Victoria, Australia. In the Macedon Ranges local government area the future climate is likely to include more hot days, less rainfall and run-off and increased frequency and intensity of extreme events such as drought, flash flooding and wildfire. The purpose of this project was to identify, analyse and evaluate climate change risks and develop an adaptation plan that would assist the Macedon Ranges Shire Council on the outskirts of Melbourne begin to plan for likely impacts arising from climate change.

The development of the adaptation plan employed a best practice risk management approach in line with AS/NZS 31000:2009 and AS 5334:2013 and took a whole-of-council approach. Undertaking a risk assessment approach to climate change adaptation planning for a peri-urban local government area was successful. The approach assisted council to build capacity in climate change, adaptation and the process of undertaking a risk assessment and define their area of operation, influence and responsibility in regards to adaptation actions and the role of other external stakeholders. Further, it helped them to integrate the risks and associated adaptation options directly into the existing risk register system and understand the relativity of climate risks to non-climate risks that the council faces, such as land use change, increasing proportions of absentee landholders and an ageing demographic.

Keywords Climate change risk • Peri-urban planning • Risk assessment • Adaptation plan and local government

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24.1 Introduction

24.1.1 *Climate Change Risks for Local Government*

Climate change presents many challenges for local government in Victoria, Australia (SMEC 2010; Stanley et al. 2013). In Macedon Ranges the future climate is likely to include more hot days, less rainfall and run-off and increased frequency and intensity of extreme events such as drought, flash flooding and wildfire (BoM 2014; Inglis et al. 2014; IPCC 2012, 2013, 2014). These changes have the potential to: Damage or disrupt infrastructure that delivers core services such as power, transport, water and communications; Increase the costs and maintenance of community infrastructure such as pools, sporting grounds, parks and gardens, halls, cemeteries and libraries; Permanently modify the habitats of the region's flora and fauna; Increase risks to developments in floodplains and bushfire prone areas; and challenge the basis of the region's economic sectors and the provision of social services.

In several recent projects, we have assisted local government agencies to prepare climate change adaptation plans in Macedon Ranges Shire, Greater Shepparton City Council and Hindmarsh Shire in Victoria, as well as Wentworth, Hay and Balranald Shires in New South Wales. The knowledge requirements of stakeholders, and tools used, are critical to adaptation planning. We have identified a number of common principles that can be applied to future adaptation planning (Larsen et al. 2013). We aim to use our experience to highlight factors that we believe are integral to successful adaptation planning using the Macedon Ranges Shire Council (MRSC) region as a case study.

24.1.2 *Climate Change in Shire of Macedon Ranges*

Macedon Ranges is a peri-urban municipality approximately located 70 km north-west of Melbourne and includes the townships of Macedon, Woodend, Kyneton and Gisborne (Fig. 24.1). The Macedon Ranges region experiences cool and relatively wet winters and warm dry summers. The current annual average temperature in the Macedon Ranges region is 14.8 °C with an observed warming of 0.7 °C over the last century. The average rainfall for the region is between 750 and 800 mm per year. There has been an observed trend of approximately 3 mm reduction in rainfall per decade over the last 110 years. For example, the recent drought period saw a 20–25 % reduction in annual average rainfall. The current number of frosts (days where the minimum temperature falls to 2 °C (DSE 2008)) are 35 with 44 days above 30 °C per year in the Macedon Ranges region.

A medium climate change scenario to 2030 plus the backcasting technique for extreme events was used to plan for the potential future climate in the Macedon Ranges region. The predicted changes in climate in the Macedon Ranges region are warmer and drier conditions on average, with an increase in frequency and severity

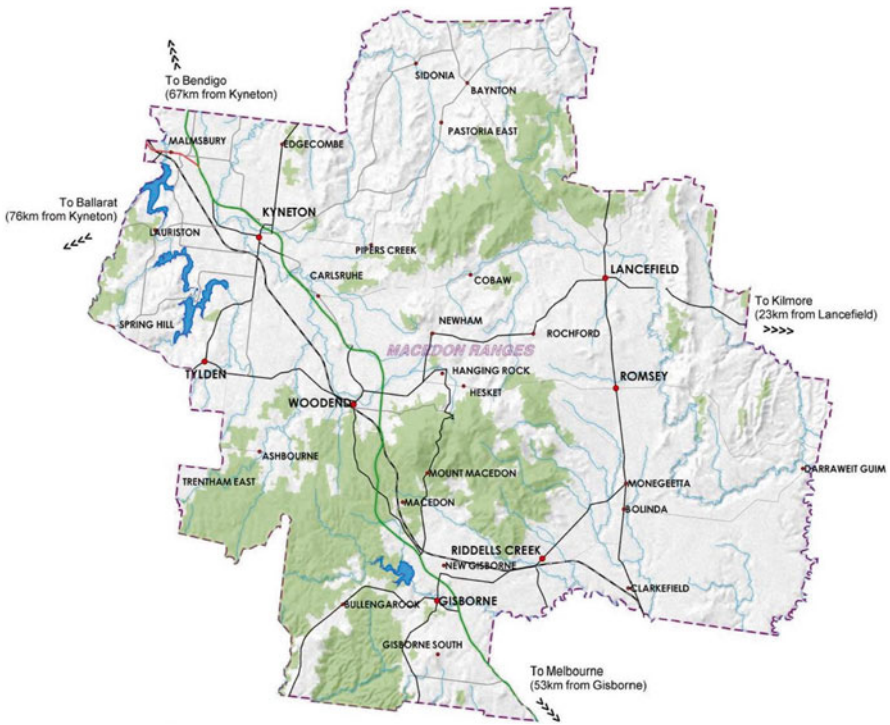


Fig. 24.1 Location of Macedon Ranges

of hot and wet extremes (DSE 2008; CSIRO and Bureau of Meteorology 2007). Climate change is likely to change the frequency and intensity of extreme weather events such as the heatwaves, drought, floods and storms in the Macedon Ranges region. The number of extreme hot days and heavy precipitation has increased since 1950 (IPCC 2012).

24.1.3 Drivers and Challenges for Climate Change Adaptation by Local Government

In addition to the risks that climate changes poses to local government as outlined above, local government have specific statutory duties to consider climate change under the *Local Government Act 1989* (Vic). This includes ecologically sustainable development (ESD) principles, mainly pertaining to mitigation or reducing carbon emissions, and the need to demonstrate a 'reasonable response', in relation to adaptation and responding to the likely impacts of climate change (England 2008).

State and federal government have implemented policy initiatives (DSE 2013; DIICSSRTE 2013) to assist local government to undertake climate change adaptation planning, recognising that local government plays a lead role in assisting communities to become more resilient to climate change and facilitate on-ground local action.

Local government has faced a number challenges in commencing climate change adaptation planning, including:

- Lack of clarity of the roles and responsibilities of council's in climate change adaptation. There is currently a process underway in Victoria to address this issue by developing a Memorandum of Understanding (MoU) between state and local government.
- A misapprehension that they lacked the in-house technical skills and knowledge of climate change to undertake adaptation planning.
- A range of views on the validity of climate change science across council and establishing whole-of-council support to undertake adaptation planning.

There is currently state government funding available to Victorian councils through the Victorian Adaptation and Sustainability Partnership (VASP) for individual councils or regional adaptation projects. Australian Government funding is available through the Local Adaptation Pathways Program to assist local government build their capacity to respond to the likely impacts of climate change.

24.2 Methodology

The development of the adaptation plan involved four main stages (MRSC 2012). This included (i) scoping and desktop review, (ii) consultation and development, (iii) analysis of risks and adaptation options and (iv) adaptation plan.

The development of the adaptation plan employed a best practice risk management approach in line with AS/NZS 31000:2009 (previously ASS 4360:2004) and AS 5334:2013 as outlined in Fig. 24.2 (AGO 2006; Standards Australia 2013).

A risk assessment workshop was held with Council managers and staff to:

- Confirm the key climate change risks.
- Identify any existing controls that may help mitigate the impact of these risks.
- Evaluate the risks – assigning consequence, likelihood and priority ratings to each of the risks. Table 24.1 outlines the risk rating matrix used in the workshop and for this project. This integrated best practice frameworks with those that existed within council to ensure compatibility.
- Identify potential adaptation options to treat the risks.
- Evaluate the adaptation options.

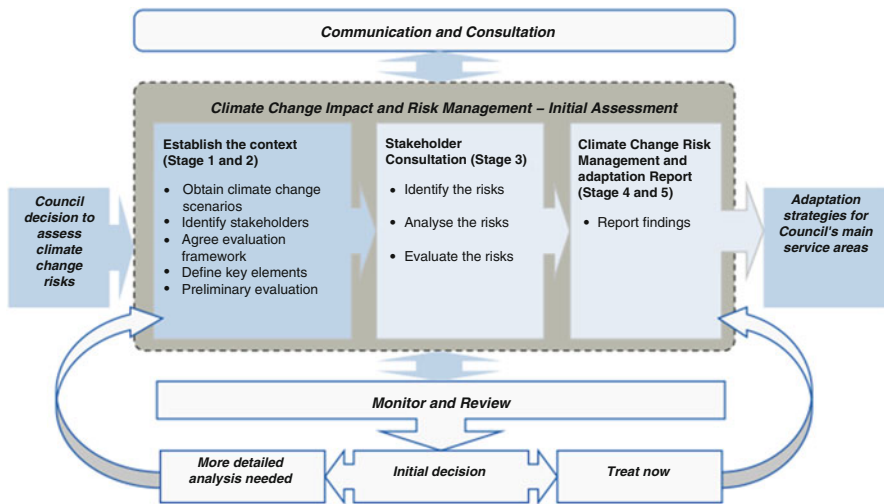


Fig. 24.2 Climate change risk assessment process for local government (AGO 2006)

Table 24.1 Priority risk rating matrix

Consequence					
Likelihood	Insignificant (1)	Minor (2)	Moderate (3)	Major(4)	Catastrophic (5)
Almost certain (A)	Medium	High	High	Very high	Very high
Likely (B)	Medium	Medium	High	Very high	Very high
Possible (C)	Low	Medium	Medium	High	Very high
Unlikely (D)	Low	Low	Medium	High	High
Rare (E)	Low	Low	Low	Medium	High

The outcome of the workshop was a list of the significant risks, an understanding of their ability to be managed and potential responses to treat the risks. An outcomes paper was distributed to Council staff and managers to seek further input on the risks and adaptation options (including their rating and priority) and on identifying gaps including additional risks and adaptation options.

Following the feedback on the outcomes paper, the risks and adaptation options were refined and validated through one-on-one consultation with Council staff (MRSC 2012). Appropriate adaptation options that minimise the risks of implementation and deal with uncertainty can be broadly classified into four categories:

- No-regret options – adaptive measures that are worthwhile (i.e. they deliver net socio-economic benefits) whatever the extent of future climate change.
- Low-regret options – adaptive measures for which the associated costs are relatively low and for which the benefits, although primarily realised under projected future climate change, may be relatively large.
- Win-win options – adaptation measures that have the desired result in terms of minimising the climate risks or exploiting potential opportunities but also have other social, environmental or economic benefits.
- Flexible – involve putting in place incremental adaptation options, rather than undertaking large-scale adaptation all at once (ICLEI Oceania 2008; Inglis et al. 2014; UK CIP 2003).

24.3 Discussion

Information and knowledge needs of stakeholders involved in adaptation planning vary and are dependent on operating context. The tools required to undertake adaptation planning govern the process and outcome. We found drawing on people's learned experience from recent extreme events was a useful technique when coupled with climate change scenarios. A number of principles for adaptation planning have been identified across the development, planning, implementation and review spectrum. These are discussed further below.

24.3.1 Development

Scoping in the development phase of the adaptation process with local government is important to establish boundaries and clarify the roles and responsibilities of council. In undertaking scoping, the cross-directorate or cross-department nature of climate change is able to be identified and communicated to key decision makers. This takes the issues of climate change beyond just an 'environmental' problem or something for which the environment directorate only has responsibility.

To the contrary, scoping of the impacts of climate change in Macedon Ranges was found to affect seven main operation and service delivery sectors:

- Economy, including tourism
- Environment and biodiversity
- Utility infrastructure – water, energy, transport and telecommunications
- Community infrastructure such as parks, sporting and recreation facilities
- Health
- Emergency planning and management
- Council capacity to service the community.

Climate change scenarios provide data on expected changes to key climate parameters such as average temperature and average rainfall. We have found that most people find it difficult to imagine these future climate change scenarios, let alone forecast their impacts and implications.

We have found that backcasting or learning from the past and ‘look back before we look forward’ (Trück et al. 2010) to past extreme events is a powerful tool in climate change risk assessment. Analysis of recent (last 15 years) extreme weather events allows the practical assessment of the current vulnerability to climate variability in the Macedon Ranges Shire, which is an appropriate starting point for the preparation of an adaptation plan. The assessment involves working with Council to describe the impacts of storms (rain, hail and wind), floods, heatwaves and droughts (UK CIP 2003) and what Council has done differently as a result of the event. For example, approximately 284 mm of rain fell during the floods in January 2011. This caused:

- Kyneton police station, the local swimming pool, Woodend nursing home and houses in Malmsbury to be flooded.
- Power outages affected 2,300 homes in Kyneton, Gisborne, Macedon and Woodend.
- In some cases the cost of past extreme events has been quantified enabling future economic costs of climate change to be forecast.

Analysing past extreme weather events enables a greater understanding of:

- Roles and responsibilities of council and other organisations.
- Impacts on staff time and resources.
- Impact on business continuity, service delivery and operations.
- Estimated costs.
- Potential ‘tipping points’ if that particular event was to become more frequent and severe.

A significant lesson for councils from the analysis is recognition that they have already undertaken climate change adaptation in learning from their responses to extreme events. Identifying partner agencies by assessing the responsible organisations during these events is a useful starting point for ensuring collaboration and communication during the adaptation planning process. This was then built upon in the consultation stage through workshops and interviews.

Appropriately framing the debate and issues during the development phase obtains buy-in and ownership over the adaptation planning process and outcomes (CRED 2009; Rickards et al. 2012). Understanding the target audience and key messages for each of these is important. For example, framing climate change as an integral issue to address from a liability or best practice perspective may be more appropriate for executives and councillors. Assets and operations staff may be more interested in reducing maintenance costs and delaying replacement of stormwater assets due to increased intensity of rainfall events. While community wellbeing staff may want to see clear benefits for vulnerable populations, such as the elderly, from the occurrence of heatwaves.

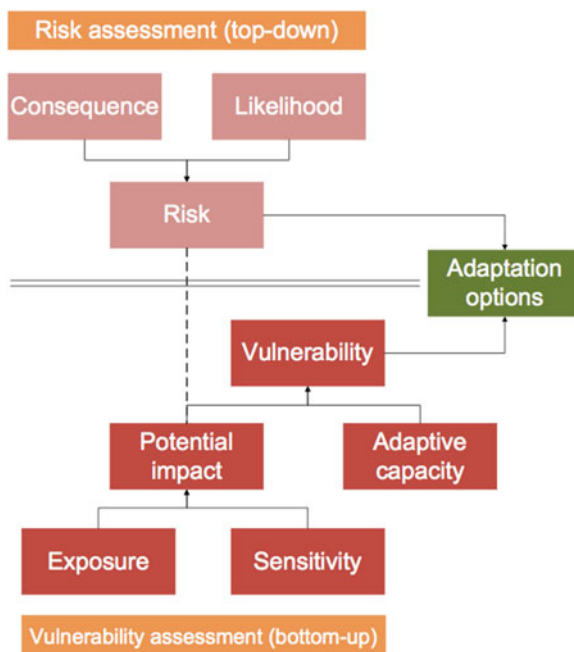
24.3.2 Planning

In the planning phase of adaptation it is important to undertake a whole-of-business approach to drive a deeper and shared understanding of the issues. This ensures that potential climate change risks, exposure and vulnerability, opportunities and adaptation options were identified for all Macedon Ranges directorates. This included Community Wellbeing, Assets and Operations, Corporate Services, Planning and Environment and Organisational Development. Translating and communicating climate change information and scientific data in a meaningful way ensures that the issues are made real and relevant (CRED 2009; Trück et al. 2010). Much of this comes back to understanding the target audience within local government.

Using trusted and authoritative knowledge brokers to deliver climate change and scientific data assists in buy-in and builds greater understanding. The technique of ‘backcasting’, or learned experience from recent extreme events, neutralises climate sceptics to focus on real events and data, and in-house lessons. Significant capacity in climate change, adaptation and the process of undertaking a risk assessment is built in undertaking the steps in the development and planning phases. The process also enables further clarification of roles and responsibilities, which is important in adaptation planning (NCCARF 2012). This includes defining local government, directorate and personnel area of operation, influence and responsibility in regards to adaptation actions, and the role of other external stakeholders.

Risk assessments and vulnerability assessment are two quite different processes in determining the possible impact of climate change (Fig. 24.3). Although risk assessments take into account preventative measures and corrective actions from outside the system to reduce the risk, they generally do not explicitly consider any intrinsic capacity from within a system to adapt to the impacts. As a result, the risk assessment may identify a system as at high risk of impact when in fact it may actually adapt quite well without external support, while others that appeared to be at low risk but do not have the internal capacity to adapt on their own are overlooked (Jacqueline Balston and Associates 2012). While the risk assessment approach governed the process for Macedon Ranges, elements of the vulnerability assessment were also used to assess internal council and external capacity to respond to the impacts of changes in climate variables.

Fig. 24.3 Comparison between risk and vulnerability assessments



Determining the relativity of climate change risk and vulnerability to non-climate change related factors is also important. This involves understanding the relativity of climate risks to non-climate risks the council faces, such as land use change, increasing proportions of absentee landholders and an ageing demographic. This is usually best established through consultation with council staff following the risk and adaptation workshop and distribution of the outcomes paper.

24.3.3 Implementation

The first stage of adaptation planning and the resultant plan includes (Fig. 24.4):

- Information and guidance on climate change adaptation and planning.
- Understanding of and engagement in adaptation planning and implementation amongst council executive, council staff and councillors.
- Resources to conduct initial assessments and planning and to facilitate and monitor implementation (MAV 2011).

The implementation of the adaptation plan requires three key factors (Fig. 24.4):

- Technical advice and collaboration on issues as they arise during implementation of adaptation plans.

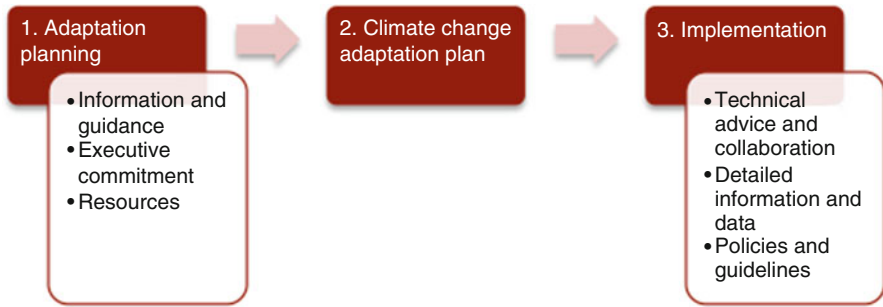


Fig. 24.4 Key needs of local government in climate change adaptation planning (MAV 2011)

- Information and data regarding projected changes in climate of sufficient detail to be integrated into Council’s asset management and business continuity plans.
- Policies and guidelines that facilitate implementation of adaptation actions (MAV 2011).

To assist this it is integral to anticipate and avoid the tendency for adaptation planning to be treated as a process separate from the other functions of council (DSE 2013). One strategy is to identify synergies with existing plans and strategies to improve efficiency (Rogers 2009), for example the Asset Management Strategy, Heatwave Plan, Natural Environment Strategy and Economic Development Strategy. Another is to embed adaptation responses in existing frameworks, processes and planning documents. This can be done through integrating the risks and associated adaptation options directly into the existing risk register system e.g. Integrated Risk Management System (IRMS). This is easily adaptable to council processes because risk assessment across the business is usually established and most staff are familiar with the approach. This worked well in the case of Macedon Ranges with a suite of ‘early adaptation actions’ and additional adaptation actions that could be investigated and developed further.

24.3.4 Review

It is essential to employ adaptive management to address uncertainty, and undertake monitoring, evaluation and review of short-term adaptation strategies (NCCARF 2012).

Using the existing council risk register system integrates the adaptation actions into existing planning and operational processes. This allows unit managers to work with their business units to monitor and implement activities within agreed timeframes to effectively manage climate risk.

It is usually recommended that the adaptation plan be reviewed every 2–3 years to evaluate progress against the adaptation actions, validate the priority risks, and

incorporate current climate change data and policy changes. This will ensure continuous improvement and constitutes best practice.

24.4 Conclusions

Climate change presents an additional element of uncertainty for peri-urban local government when undertaking strategic planning. In recognising the information and knowledge needs of various stakeholders and effective tools, it is important that local government agencies and associated organisations consider their operating context and learn from the past, while taking a holistic, iterative and flexible approach to adaptation planning.

Undertaking a risk assessment approach to climate change adaptation planning for a peri-urban local government area was successful. The approach assisted council to:

- Build capacity in climate change, adaptation and the process of undertaking a risk assessment.
- Define their area of operation, influence and responsibility in regards to adaptation actions, and the role of other external stakeholders.
- Integrate the risks and associated adaptation options directly into the existing risk register system.
- Understand the relativity of climate risks to non-climate risks the council faces, such as land use change, increasing proportions of absentee landholders and an ageing demographic.

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