

**Climate Change Adaptation
Good Practice - Case Study**

City of Melbourne Climate Change Adaptation Strategy and Action Plan



About Adaptation Good Practice

Adapting to climate change is a relatively new concept to many. It is important to learn from practitioners who are undertaking adaptation activities that are beginning to have tangible outcomes. Documenting examples of good practice and identifying the criteria that makes them work, enables those interested in adaptation to learn about how to take action.

There are expectations that Adaptation Good Practice (AGP) includes a definite start and finish to a project. However climate change practitioners' experiences show that adaptation projects are often steps in longer learning journeys. There are no golden rules on how to adapt and often practitioners across Australia are inventing the wheel that drives future AGP. This case study of City of Melbourne's Adaptation Strategy and Action Plan is part of a series of 16 case

studies that recognise exemplars for AGP in Australia. Through the development of these stories of successful adaptation it was refreshing to see an emergence of similar experiences and challenges regardless of the project or location. A synthesis of these stories can be seen in the Synthesis Report 'Climate Change Adaptation Good Practice: Key lessons from practitioners experiences', which will help practitioners to understand that they are not alone in their challenges and to see some of the clear lessons learned about what drives good practice in adaptation.

Following the Snapshot there is a more in depth narrative of the experiences, learnings and network links to stimulate further engagements and knowledge sharing among the growing community of adaptation practitioners.

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Case study snapshot

City of Melbourne Climate Change Adaptation Strategy and Action Plan

The City of Melbourne Climate Change Adaptation Strategy and supporting Action Plan address high-level risks of extreme weather events including heat waves and flash flooding, with the aim to reduce their impending impacts on the City's current and evolving conditions, including a projected doubling of the population in the municipality to 145,000 people by 2030.

Strong leadership from the Lord Mayor and senior managers throughout the project has resulted in ongoing and successful implementation of action plans that include enhancing the resilience and diversity of urban forests, and researching design strategies for cool roofs to reduce the Urban Heat Island effect. Other measures of success include leadership of a professional climate change adaptation network, comprising managers of partner organisations, which has been formed to discuss emergent issues and adaptive learnings. These outcomes inform the current research and development of a new four-year Action Plan.

The project journey

The City of Melbourne's adaptation journey began with the publication of Future Melbourne - City of Melbourne (2008). This long-term plan for the future direction of the City of Melbourne was developed by Council through open collaborative public engagement. It acknowledged that Climate Change presents key strategic risks for the organisation, the community and key stakeholder groups in the municipality. And it made it clear to stakeholders that the effect of climate change is an imperative that must be addressed.

Future Melbourne provided the impetus to undertake a comprehensive climate change risk assessment, culminating in an integrated City of Melbourne Climate Change Adaptation Strategy and supporting Action Plan. These have been implemented by dedicated staff members, with current responsibilities for developing a new 4-year Action Plan- implementing their plan. The City's adaptation journey has involved comprehensive stakeholder consultation with professional networks, other councils, the Victorian and Australian governments, universities and non-government organisations.



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Figure 1: The City of Melbourne (CoM) comprises the city centre and the inner suburbs

By 2030, Melbourne is likely to be significantly affected by warmer temperatures and heatwaves, lower rainfall, intense storm events and flash flooding

Drivers for adaptation action

Recognition that Climate Change presents key strategic risks for the City of Melbourne Council ('the CoM'), the community and key stakeholder groups in the municipality.

→ Adaptation action

The CoM is cushioning, neutralising, adjusting and avoiding climate risks and impacts by focusing on building resilience.

In particular, CoM is building water system resilience and increasing the City's passive cooling efficiency.

Risks and impacts addressed

By 2030, Melbourne is likely to be significantly affected by warmer temperatures and heatwaves, lower rainfall, intense storm events and flash flooding¹. Drought and sea level rise also present critical risks for the City. Immediate high-level risks that require addressing are intense rainfall and wind events, heatwaves and drought.

Outcomes achieved

- Comprehensive assessment of critical risks and analysis of their potential impacts and implications for Melbourne now, in 2030, and in 2070
- Action Plan developed to address key risks and build resilience
- Delivering a range of high value adaptation/mitigation action steps including:
 - Various Water Sensitive Urban Design projects
 - Urban Forest Strategy
 - Cool Roofs

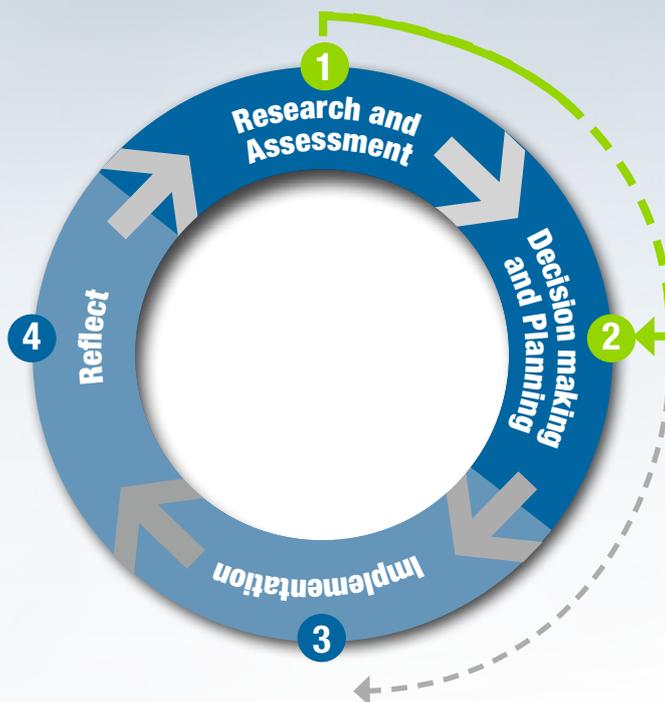


Figure 2: City of Melbourne Climate Change Adaptation Strategy and Action Plan Adaptation Good Practice phase

- Green Roofs
- Heat mapping of Melbourne
- Hot and cool spot analysis
- Drainage infrastructure upgrades
- Social research.

Emerging outcomes

Findings from new research projects released in April 2013 will drive changes in the new 4-year Action Plan, which CoM is currently developing:

- Port Phillip Bay Coastal Adaptation Pathways Project
- Urban Heat Island (UHI) study

The project

The City of Melbourne Climate Change Adaptation Strategy and Action Plan address high-level risks and are aimed at reducing impacts on the City's current and evolving conditions, including a projected doubling of the population to 145,000 people by 2030. To identify and assess the likelihood of critical risks occurring now, in 2030, and 2070, CoM drew on stakeholder inputs and scientific evidence including the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4 2007) and Climate Change in Australia - Technical Report¹.

Key aims, objectives and actions

- Undertake a comprehensive assessment of high level climate change risks
- Determine which risks are regarded as tolerable by the organisation and the community, or critical and requiring adaptation strategies.
- Clarify the risk management approach to reduce the likelihood and consequence of critical risks, in alignment with the Australian and New Zealand risk standard AS-4360
- Develop and implement an Action Plan focused on building resilience

Risks and impacts addressed

CoM was forewarned that by 2030, the City is likely to be significantly affected by warmer temperatures and heatwaves, lower rainfall, intense storm events and flash flooding¹. In addition, four potential extreme event scenarios for the broader Melbourne region required a more comprehensive assessment of these climate change risks:

- Less rainfall and more chance of drought
- Extreme heatwaves and bushfires
- Intense rainfall and wind storms
- Sea level rise

Each risk was assessed on a 1 to 5 scale for its likelihood of occurring and the consequences. Critical risks requiring the most serious management and

monitoring attained a combined rating of 7 or more. All critical risks have been detailed to identify their risk attributes, stakeholders, recommended adaptation measures and next steps.

Immediate impacts of intense rainfall and wind events, heatwaves and droughts

Risk ratings for intense rainfall are shown in Table 1 below.

Table 1: City of Melbourne risk ratings for intense rainfall and wind events. A risk rating above 7 is considered critical by Council and leads to high priority actions.

The City of Melbourne risks identified and assessed

Risk title and rating	Now	2030	2070
Mass stranding of people due to public transport stoppages, as a result of flooding or storm damage	8	9	9
Adverse health outcomes due to emergency services being hindered by storm and flood impacts, such as flooded roads, traffic delays and other blockages.	8	8	8
Increased potential for injuries or deaths occurring as a result of flash flooding.	7	9	10
Increased reparation costs following intense rainfall and wind events, including damaged buildings, damaged or collapsed roads, damage to river banks and associated infrastructure, general clean-up.	7	8	9
Business closure and job loss due to business interruption from storm damage and flooding.	7	8	8
Increased potential for injury, death, damage or delays resulting from damage to or falling trees.	7	6	6
Lost tourism following storms or intense rainfall events.	6	7	7
Burst water supply pipes.	6	5	5
Increased potential human health risk as a result of sewer inundation.	5	6	6
Cleanup costs and disruptions from cars damaged/stranded by flash flooding.	5	6	6
Increased frequency and severity of public health risk from waterways. This is due to increased toxin concentrations entering waterways following intense rainfall events and reduced access for amenity purposes.	5	5	4
Public discontent due to reduced access to rivers and river banks for amenity and bike/pedestrian commuting purposes following intense rainfall events.	4	4	4

Table 2: City of Melbourne risk ratings for extreme heat and bushfire events. A risk rating above 7 is considered critical by Council and leads to high priority actions.

The City of Melbourne risks identified and assessed

Risk title and rating	Now	2030	2070
Increased heat stress related death / illness among at risk population groups.	8	9	9
Passengers become stranded as trains to the City of Melbourne are delayed / cancelled in hot weather.	8	8	9
Blackout.	7	6	6
Increased violence / anti-social behaviour causing increased public nuisance and hospital admissions.	7	7	7
Increased prevalence of food borne disease.	6	6	6
Increased maintenance costs of assets and infrastructure.	7	7	6
Disruption to any outdoor event due to hot weather.	6	6	7
Reduced public and social use of space during heat waves.	6	6	7
Business interruption due to electricity blackout.	6	5	5
Heat stress related illness among outdoor City of Melbourne workers. This is caused by an increased number of hot days and becomes especially exacerbated during hot spells.	6	6	6
Respiratory illness and social disruption due to bushfire-related poor air quality.	5	6	6
Train and tram derailments / accidents result in injuries and major disruptions.	5	5	6
Increased closure of schools due to poor air quality.	5	5	5
Future liability and reputation damage relating to construction of dwellings or infrastructure unsuited to projected climatic conditions.	3	6	8

Risk ratings for extreme heat waves and bushfires are shown in Table 2 above. These extreme weather events are the most immediate high-level risks to address, and are projected to happen more frequently and/or with greater intensity in coming years^{2,3,4}.

Sectoral impacts of each critical risk are shown pictorially as ‘cascading consequences’ in the Figure 3 on page 7 for intense rainfall and wind events, and Figure 4 for extreme heat wave

and bushfire events. Their impacts can be devastating on Council facilities, businesses, parks and gardens, sports facilities, critical infrastructure including transport systems, and the health and wellbeing of residents and visitors^{5,6}. Stark examples of these impacts include:

- A run of 4 extreme heatwave days in late January-early February 2009 that culminated with the Black Saturday bushfires

- Flash flooding in early February 2011 from the remnant of Cyclone Yasi that brought chaos to Melbourne’s trains and road traffic
- Most recently, the ‘angry summer’ of 2012-2013 which brought another record-breaking run of heat wave days and more flash flooding events to the City⁷.

Response strategy

CoM’s responses strategies and action plans to cushion, neutralise, adjust or avoid climate change risks and impacts are focused on building resilience. Two key areas of adaptation are considered ‘high value’ in their potential to reduce impacts across several risks and provide other benefits including enhanced biodiversity:

1. Harvesting storm water across the municipality and converting it into a valuable resource that builds the City’s water system resilience, by:
 - Reducing flash flooding
 - Reducing potable water usage
 - Watering parks and street trees
 - Protecting soil moisture levels to benefit habitat and biodiversity.
2. Increasing the City’s passive cooling efficiency to reduce the UHI effect, which substantially heightens the vulnerability of people in the city to heat stress, injury or death. – especially children and elderly people with cardiac, respiratory and diabetic conditions^{8,9}. Measures to reduce the city temperature both inside buildings and at street level can provide considerable benefits to reducing overall exposure.



<http://greenroofs.files.wordpress.com/2007/05/ch2.jpg?w=567&h=425>

Figure 3: Cool roof. Melbourne's 6-star CH2 building, one of the greenest buildings in Australia

High value action plans

High value components of the Action Plan are aimed at reducing critical risk ratings to tolerable levels and enhancing resilience. They include:

- Funding urban forest projects
- Trialling cool roof technologies to minimise the UHI effect
- Improving water efficiency in Council-managed assets, commercial buildings, and residential buildings, through CoM's water management strategy: Total Watermark – City as a Catchment.

Measurable targets achieved

Measurable targets are being achieved for the Urban Forest Strategy and Total Water Mark - City as a Catchment. These

targets are described below. Broader-scale behavioural change targets are often difficult to measure but CoM has commissioned social research into community resilience.

Implementation successes

Successes in implementing the Action Plan

Conversations between CoM's Sustainability Branch and Planning team to address risks have been instrumental to successfully implementing the Action Plan, notably the following three programs:

Urban Forest Strategy

Melbourne's urban forest is facing two significant challenges: climate change

and urban growth. The Urban Forest Strategy seeks to manage these challenges and protect against future vulnerability. This will be achieved by measures including:

- Increasing canopy cover from 22 per cent to 40 per cent by 2040
- Improving soil moisture
- Informing and consulting with the community
- Increasing forest diversity with no more than five per cent of one tree species, no more than ten per cent of one genus and no more than 20 per cent of any one family.

Cool roofs program

CoM is committed to achieving zero net emissions (ZNE) by 2020. A key step in meeting this goal is reducing the amount of energy used to cool the city's buildings. In 2011, CoM commissioned the University of Melbourne to research how different cool roof products perform in Melbourne's climate. The results of this research can be used to identify buildings where the installation of a cool roof would be beneficial. The installation of a cool roof (specifically on commercial buildings) will often result in decreased energy use for cooling, therefore contributing to the ZNE target. The 1200 Buildings Program aims to encourage and support building owners and facility managers to improve the energy efficiency of commercial buildings.

Total Water Mark - City as a Catchment

Total Watermark – City as a Catchment outlines CoM's goal to become a water sensitive city and aims to protect waterways, respond to climate change and sustainably manage the total water

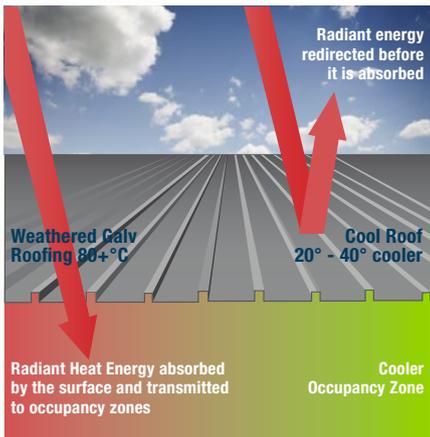


Figure 4: How cool roofs function to reduce UHI effect

cycle. It frames the water components of the Adaptation Strategy within a 'city as a catchment' context. The overall municipal-wide target for reduction in potable water consumption is 25 per cent by 2020. This includes savings across commercial and residential sectors and Council's own operations. This program is being fully reviewed in 2013 to align it with changes in policy design, technology, behaviour change and other factors.

Resolving challenges

CoM is resolving several key challenges to implementing the Action Plan. These include:

1. Embedding adaptation in different areas of the organisation
2. Significant capacity building and extensive capital investment required for effective delivery.
3. Understanding and defining roles and responsibilities of different stakeholders in managing climate change risks

4. Modifying standard corporate risk management approaches which do not lend themselves easily to climate change risk management.

Outcomes achieved

Shorter-term intended outcomes of the Adaptation Strategy that have been achieved include:

- Initial Action Plan developed including the Urban Forest Strategy
- Initiating the Inner Melbourne Climate Adaptation Network (refer to Leadership and Engagement, page 9)
- Research undertaken into heat and flood risks in Melbourne
- Community information on risks and actions made publically available
- Research into Cool Roofs made available for building owners and developers to consider
- Ongoing implementation of the initial Action Plan. This has encompassed new research projects on economic analyses of heat forecasts, and case studies of flood risks in Southbank and Arden Macaulay in the Port Phillip Bay Coastal Adaptation Pathways Project.

Emerging outcomes

Towards a new 4-year Action Plan

A number of people and branches of Council are contributing to the delivery of the Action Plan, and to current phases of research that inform the work towards a new 4-year Action Plan. Other anticipated longer-term outcomes of the Adaptation Strategy's rollout include:

- Roles and responsibilities defined
- Clarification of time frames around longer-term impacts and how to manage their associated risks, through building community resilience
- Developing good connections between decision-makers, through the Inner Melbourne Climate Adaptation Network
- Stepping up towards aligned, consistent adaptation decision-making across the City.

Critical success factors

AGP analysis of the project

Success of this project's approach to adaptation has been driven by strong leadership in CoM, good engagements with key stakeholders and research partners, and professional networking through the Inner Melbourne Climate Adaptation Network.

This project is strong in:

→ **Leadership**

→ **Engagement**

→ **Connectivity**

Leadership

CoM has taken on a leadership role for the municipality by demonstrating that prudent stewardship is the requisite response to climate change. The Lord Mayor and other leaders at senior levels in the organisation have been drivers in making adaptation a priority – and their leadership has been essential to moving forward in this space.

CoM's leadership has also been demonstrated through initiating and coordinating the Inner Melbourne Climate Adaptation Network. This invite-only network meets quarterly to actively connect ongoing research, strategy development, and implementation work. It includes climate managers, energy providers, water utilities, CSIRO, Bureau of Meteorology (BoM), Victorian Centre for Climate Change Adaptation (VCCCAR), and Victorian Government departments including Sustainability and Environment (DSE), Transport, Health,

The Lord Mayor and other leaders at senior levels in the organisation have been drivers in making adaptation a priority – and their leadership has been essential to moving forward in this space.

Human Services and Emergency Service organisations.

Community leaders and champions were not specifically involved in the risk assessment phase. However, CoM would like to enhance community involvement in developing resources to address resilience, and aligning stakeholder programs in the new 4-year Action Plan.

→ Leadership lesson learnt:

High level leadership ensures everyone in the organisation is focussed and aware.

Setting up an 'invite only' network actively connects leaders in the field to meaningful research, strategy and implementation.

Engagement

Within CoM, many internal partners are engaged across the organisation in incorporating climate risks in their work. Through its Corporate Risk Register of key strategic risks, responsibility for adaptation risk management has been allocated to branches of the organisation including engineering, planning, events, community engagement, and risk and governance.

CoM aims to ensure that all stakeholders and the community understand how they share roles and responsibilities in

implementing an integrated action plan, and also encourages them to undertake their preferred adaptation options. These aims can be achieved by participating in collaborative projects and/or by undertaking their own adaptation actions.

Key stakeholder groups are primarily engaged through the Inner Melbourne Climate Adaptation Network. CoM has developed many relationships with key stakeholders in the Network and associated communities of practice including the universities affiliated with VCCCAR - University of Melbourne, Monash, RMIT, and Swinburne. The Network provides important functions in integrating and aligning key stakeholders and gatekeepers for major business and infrastructure assets and investments, and in scoping new initiatives. It also provides opportunities for further significant adaptation strategies and actions to develop, within the organisation and among other key stakeholders.

→ Engagement lesson learnt:

Effective linkages with the right players supports integrated planning, common ownership of the approach and commitment to the project for the long-term.

Key stakeholder groups are primarily engaged through the Inner Melbourne Climate Adaptation Network.

Connectivity

A number of neighbouring councils and some further afield have referred to the Adaptation Strategy for higher-level advice and direction in conducting their risk assessments and developing their action plans.

→ Connectivity lesson learnt:

Connecting with all nearby councils, ensures that users of the city are strongly engaged.

Sustainability

CoM's adaptation work involves considering future impacts of climate change on the intergenerational needs of residents, businesses and visitors including health and community facilities, and access to open space. The Sustainability Branch is considering a range of future impact scenarios to assist in developing flexible longer-term plans and strategies that will avoid or minimise risks of maladaptation.

→ Sustainability lesson learnt:

The Adaptation Strategy influences long term downstream outcomes including:

- Influencing stakeholders, through sharing information and ongoing work
- Enhanced community awareness and resilience

Cost

This project was partly funded by the then Department of Climate Change and Energy Efficiency (DCCEE) under its Local Adaptation Pathways (LAPP) Program and was published in June 2009.

CoM has invested some \$30 million in climate change policy and initiatives in 2010–11, and \$11.2 million in 2011-12. See links section on page 12 for more information.

Cost benefits analyses have been conducted for two new reports on economic impacts of:

- Heat forecasts, released in April 2013
- Flood risks in Southbank and Arden Macaulay, as case studies in the Port Phillip Bay Coastal Adaptation Pathways Project

CoM has some funding and resources to enable future phases of action planning but in order to implement a number of programs it will be looking for external funding.

→ Cost lesson learnt:

Seed funding can support a process with long term benefits to the community.

Good planning can target initiatives and expenditure into the future, ensuring that realistic long-term outcomes can be achieved.

Conclusion

Development of City of Melbourne's Adaptation Strategy was primarily focused on conducting a comprehensive risk assessment of extreme weather events including heat waves and flash flooding, and sea level rise to guide decision-making. This was foundational to developing firm relationships between risk management and ongoing implementation of the Action Plan. It is aimed at reducing critical risk ratings to tolerable levels, and enhancing resilience, through various high value projects including:

- Funding urban forest projects
- Trialling cool roof technologies to minimise the UHI effect
- Improving water efficiency through CoM's water management strategy: Total Watermark – City as a Catchment.

A new 4-year Action Plan is currently being developed which will extend the scope of the City's adaptation achievements.

CoM has successfully addressed a crucial information gap in the organisation, by identifying and assessing its high level climate change risks.

However, some flow-on implementation processes (e.g. to manage waste streams) were the missing key components in the Adaptation Strategy, at its release in 2009. These implementation gaps have since been addressed by a series of collaborative research projects with universities and key stakeholders that are informing the development of a new 4-year Action Plan.

Gaps and future challenges

CoM's Adaptation Strategy is currently not linked with specific regional or state projects. However, this situation may well change in the near future. The Senior Sustainability Officer, City of Melbourne, has indicated that "We intend to consider how our Strategy and work in this space links with the newly released Victorian Adaptation Strategy."

Links to more information and projects

- Port Phillip Bay Coastal Adaptation Pathways Project- see www.melbourne.vic.gov.au/Sustainability/AdaptingClimateChange/Pages/PortPhillipBayCAPP.aspx
- Urban Heat Island (UHI) study see www.melbourne.vic.gov.au/Sustainability/AdaptingClimateChange/Pages/UHIReport.aspx
- www.melbourne.vic.gov.au/Sustainability/CouncilActions/Pages/AdaptingClimateChange.aspx
- www.melbourne.vic.gov.au/sustainability/adaptingclimatechange/Pages/AdaptingClimateChange.aspx
- CoM investments in climate change policy and initiatives in 2010–11 and 2011–12 - www.melbourne.vic.gov.au/SUSTAINABILITY/COUNCILACTIONS/Pages/AdaptingClimateChange.aspx



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