

CLIMATE CHANGE ADAPTATION STRATEGY REFRESH

2017





AN ECO CITY

We provide solid foundations for the sustainability of Melbourne's communities. We embrace the unfamiliar if it helps us achieve our ambitions. We continue to encourage our community to take positive actions and we lead by example locally, nationally and globally.

MESSAGE FROM THE CITY OF MELBOURNE

The City of Melbourne has set an ambitious target for Melbourne to become a carbon neutral city. Due to the global nature of climate change, our ambitious actions to reduce greenhouse gas emissions cannot prevent changes to our local climate, which we are already experiencing. The City of Melbourne is committed to responding to the impacts of climate change.

Through Future Melbourne 2026 we know that Melburnians value an inclusive, family friendly, culturally diverse city that protects its natural environment and provides access to good jobs. This refreshed strategy will build the resilience of our municipality to the impacts of climate change, so our community can continue to enjoy the things they value.

We have already taken steps to mitigate our impact and adapt to climate change and have been recognised for our leadership. Future action needs to continue to take multiple climate hazards into account, including drought and reduced rainfall, heatwaves and bushfires, intense rainfall and storm events, and sea level rise.

Everyone has a role to play in preparing for a changing climate, and many of our residents, local businesses, neighbours and the Victorian and Australian Governments, along with international players, have also taken action.

This refresh of our 2009 Climate Change Adaptation Strategy provides updated direction for how we plan, prepare for and respond to the impacts of climate change. It outlines

our priorities for adapting to climate change, and complements important existing activities within the broader municipality.

Climate change adaptation is an ongoing process. We need to regularly review our progress against our goals and the specific targets which are outlined in existing and future strategies. Total Water Mark: City as a Catchment, for example has targets specifying that by 2030, 20 per cent of municipal water will be sourced from alternative sources and drainage infrastructure upgraded to cater for a 1 in 20 year flood event. The Urban Forest Strategy has a target to double the canopy cover to 40 per cent in the public realm by 2040.

These targets are ambitious today but as new technology and information becomes available we will review these targets and include additional ones, such as permeability targets (as outlined in this strategy).

Adapting well to climate change means we are working in collaboration with our partners to respond to the impacts of climate change and action that we take results in multiple benefits. Our natural environment and green spaces are enhanced, our built form and new infrastructure is built considering a future climate and our community know what to do to protect themselves during extreme weather events. As the climate changes we continue to prosper and thrive.

We look forward to working with you to help Melbourne continue to adapt to climate change.



Robert Doyle
Lord Mayor



Cr Cathy Oke
Chair, Environment Portfolio

Acknowledgements

The City of Melbourne respectfully acknowledges the Traditional Owners of the Land.

For the Woiwurrung (Wurundjeri), Boon Wurrung, Taungurung, Dja Dja Wurrung groups who form the Kulin Nation, Melbourne has always been an important meeting place for events of social, educational, sporting, and cultural significance.

Today we are proud to say that Melbourne is a significant gathering place for all Aboriginal and Torres Strait Islander people.

Many people have contributed ideas presented within this strategy including within the broader City of Melbourne community and key stakeholders.



CONTENTS

1. Introduction	6
2. Changes since 2009	9
2.1 Melbourne's climate context has evolved	9
There are significant climate impacts in Melbourne	9
Population growth projections have increased	9
Policy and regulatory changes apply at global, national and state levels	12
Our community wants action	12
2.2 Best practice in city climate change adaptation leadership	14
Local government has an important role	15
2.3 We have made progress but there is more to do	16
Melbourne's climate change risks remain significant	16
Our achievements to date	17
Opportunities to strengthen our climate change adaptation approach	18
3. We need a stronger partnership approach	21
4. Our new vision, goals and principles	23
Goal 1: Enhance the natural environment and green spaces of our municipality	24
Goal 2: Shape our built form and urban renewal areas to withstand future climate change impacts	26
Goal 3: Strengthen the resilience of our inclusive, family friendly and culturally diverse community	28
Goal 4: Protect and enhance our diverse economy	30
Goal 5: Continue to build Melbourne's climate change adaptation capabilities and expertise	31
5. Developing new ways to measure our progress	33
Appendix 1: Climate Change Adaptation Action Gap Analysis	34
References	38

April 2017

Disclaimer

This report is provided for information and it does not purport to be complete. While care has been taken to ensure the content in the report is accurate, we cannot guarantee it is without flaw of any kind. There may be errors and omissions or it may not be wholly appropriate for your particular purposes. In addition, the publication is a snapshot in time based on historic information which is liable to change. The City of Melbourne accepts no responsibility and disclaims all liability for any error, loss or other consequence which may arise from you relying on any information contained in this report.

To find out how you can participate in the decision-making process for City of Melbourne's current and future initiatives, visit melbourne.vic.gov.au/participate

1. INTRODUCTION

Climate change is already having far reaching impacts across the world and Melbourne has experienced these impacts over recent years; including drought, flooding and extreme heat events. Experts warn that these events are not only going to become more intense but they are also going to occur more often, regardless of strong action on reducing greenhouse gas emissions. Climate change adaptation is the process of planning, preparing, responding and driving adjustments in our city now, to ensure that we can survive and thrive no matter how the climate changes.

The City of Melbourne's risk-focussed Climate Change Adaptation Strategy (2009) was the first of its kind in Australia. We have made substantial progress since then, implementing over 100 climate change adaptation actions. Much of our climate change adaptation work is now embedded into the way we work on a daily basis or is an integral part of our other strategies and plans (refer to Figure 5 on page 19).

We have increased stormwater harvesting to irrigate our parks and street trees and reduced flood risk, increased green space and canopy cover, and enhanced biodiversity across the city to reduce the impacts

of heatwaves. We are building strong relationships with key partners across the municipality to deliver multiple benefits through coordinated action and embed climate change adaptation in decision making processes.

Updated scientific information and recent policy developments have prompted us to rigorously evaluate our 2009 strategy to determine where we should now focus our efforts and update our approach accordingly.

Figure 1 outlines the climate change adaptation process. We are currently at phase four of the process.

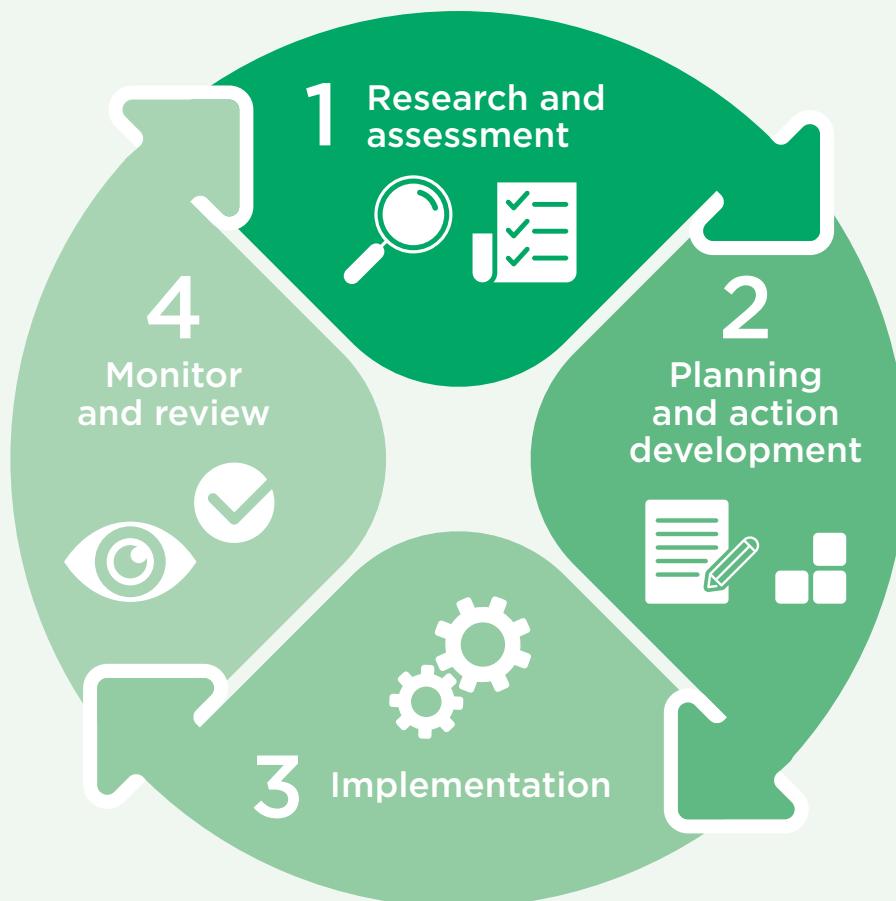


Figure 1: The climate change adaptation process

Significant developments over the past few years include:

- The scientific evidence base for human-induced climate change and its impacts is stronger than ever.
- The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement has entered into force and the United Nations released its sustainable development goals.
- The Australian and Victorian Governments have recently released climate change adaptation strategies (2015 and 2017 respectively).
- At around 140,000 residents in 2017, we are experiencing stronger population growth in Melbourne than was forecast in our 2009 strategy.
- Cities around the world are implementing new and innovative ways to adapt to climate change.
- There is strong community support for increased action on climate change adaptation, as evidenced through the Future Melbourne 2026 engagement.

This strategy refresh takes these developments into account and draws upon expert advice and best practice climate change adaptation strategies from major cities around the world. We also undertook extensive internal, community and stakeholder consultation to inform this strategy. The consultation considered the challenges associated with climate change adaptation and identified solutions.

The strategy refresh details how we will increase our existing efforts and implement new actions to work towards our vision of a city that is adapting well to climate change. We want Melbourne to prosper and thrive and continue to be a global leader in climate change adaptation.

Five goals will guide how we work to deliver, partner and advocate for effective climate change adaptation:

Goal 1: Enhance the natural environment and green spaces of our municipality.

Goal 2: Shape our built form and urban renewal areas to withstand future climate change impacts.

Goal 3: Strengthen the resilience of our inclusive, family friendly and culturally diverse community.

Goal 4: Protect and enhance our diverse economy.

Goal 5: Continue to build Melbourne's adaptation capabilities and expertise.

In designing the next steps under each of these goals, we aim to deliver multiple benefits for our community beyond climate change adaptation, such as recreation spaces and stronger social and community networks. We have also built in flexibility, and openness to future options, in order to remain responsive as additional or improved information becomes available.

“Many cities are now developing Climate Adaptation or Climate Resilience Plans with ambitious lists of actions and interventions. But it is still quite rare to see cities revisit these plans after several years of implementation to review progress, update projections and refresh their action plans. I congratulate the City of Melbourne for undertaking this ‘Refresh’ phase of their Adaptation Plan in such a robust and inclusive manner.”

– Steve Gawler, Regional Director ICLEI Oceania



2. CHANGES SINCE 2009

2.1 Melbourne's climate context has evolved

There have been many changes since we published our Climate Change Adaptation Strategy in 2009. Melbourne's climate context has evolved, population growth projections have increased, and global and national policy and regulations have changed.

There are significant climate impacts in Melbourne

Our city's current climate is already warmer and drier than historical averages. Over the past 20 years, Melbourne has experienced many extreme weather events and climatic trends (refer to figure 2 on page 10). Every year in Australia new heat records are broken, the Climate Council Australia noted that in some locations in 2016-17 the number of days above 35 degrees is exceeding what was projected for 2030.

In the future, Melbourne is likely to experience ongoing changes to its climate, including:

- less rainfall and longer and more frequent periods of drought
- more frequent and intense heavy downpours
- more frequent days of extreme heat, heatwaves and fire weather
- rising sea levels.

These changes require leadership from the City of Melbourne and our partners to ensure we minimise the adverse impact of future events and harness opportunities for our city and its people.

The way we prepare for these changes depends not only on climatic and environmental factors, but also on our understanding of social, technological, economic and political factors in our city and beyond.

Population growth projections have increased

Melbourne municipality's resident population was over 136,000 in 2016, and another 900,000 people use it each weekday for work, recreation, education, and other purposes (as at 2017).

It was previously forecasted in 2009 that the residential population would grow to over 145,000 people in 2031 from 76,000 people in 2008. We are close to reaching this forecast for 2031, fourteen years early. Based on new forecasting done in 2016 the municipality's residential population is now expected to reach over 262,000 by 2036. Daily users of the city are also expected to increase by 23 per cent by 2024.

The municipality's population is expected to nearly double in the next 20 years while greater Melbourne will increase from 4.5 million in 2017 to eight million.

In the inner city, this means our population will continue to expand into high rise buildings for residential and student accommodation as well as into low-lying renewal areas at higher risk of impacts from flooding and storm surges. As the city becomes more densely developed, we also need to manage risk to human health and wellbeing arising from urban heat.

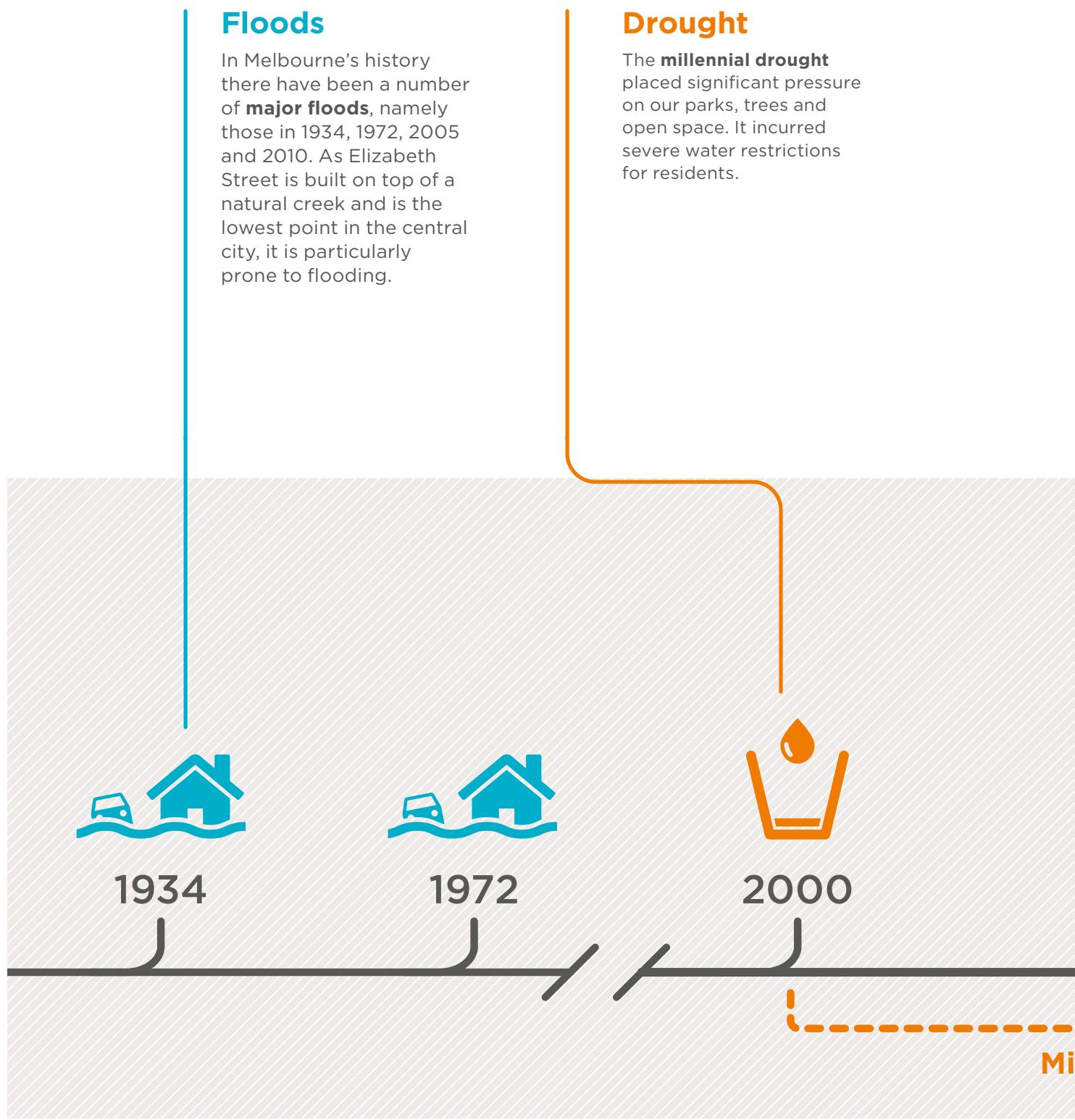


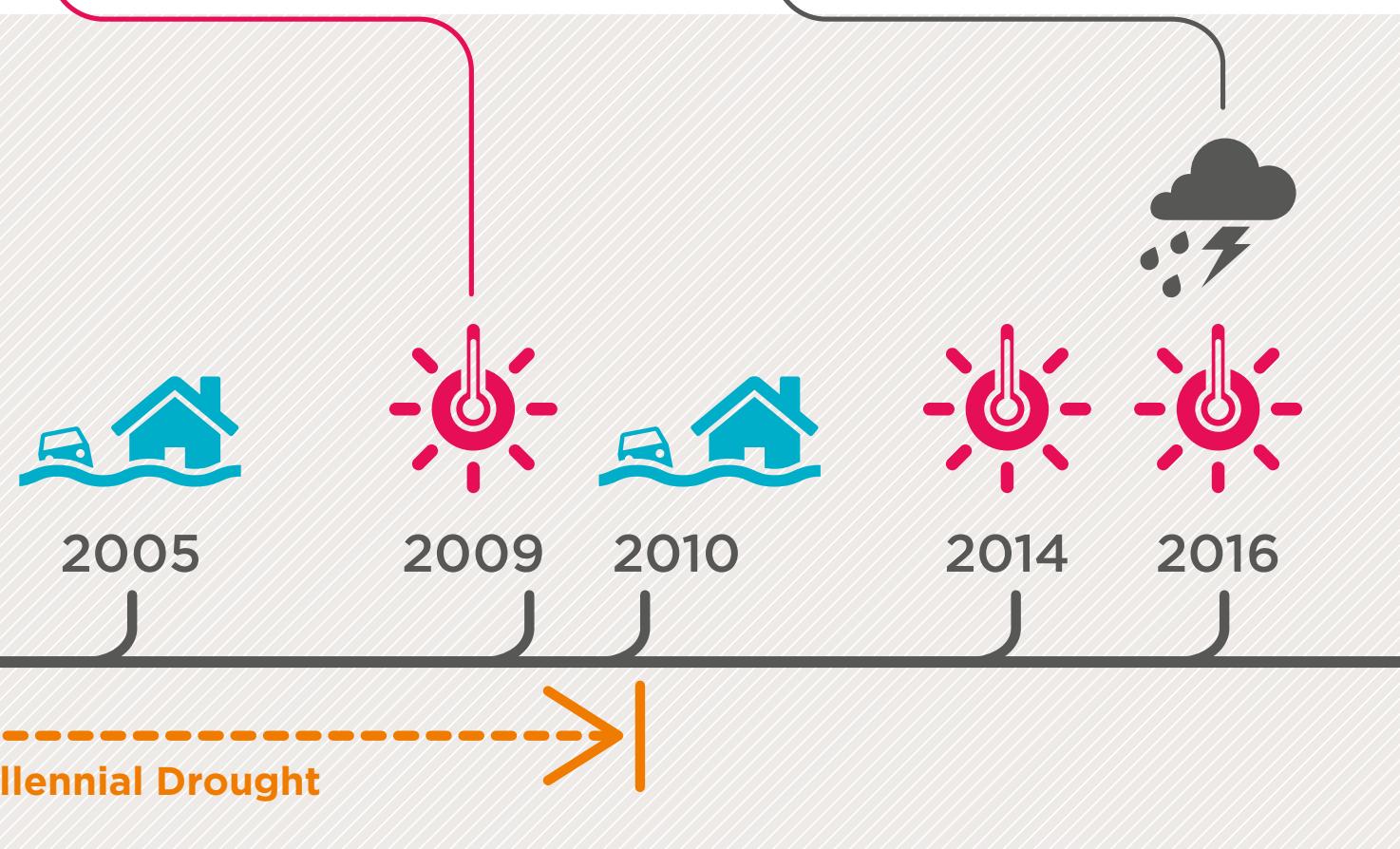
Figure 2: Significant extreme weather events experienced in Melbourne

Heatwaves

During the 2009 **heatwave**, in addition to the devastating bushfires that claimed 173 lives in Victoria, the city experienced a blackout, which led to closures of the city's rail and tram networks. The total economic costs of the heatwave were estimated to be \$800 million. There was increased demand on health services including a 46% increase in ambulance callouts and a 12% increase in emergency department presentations. In addition there was a significant impact on mortality with 374 excess deaths recorded during the heatwave period (DHS 2009). Research undertaken on the 2014 heatwave showed businesses in the City of Melbourne lost an estimated \$37 million in revenue over the four days of the heatwave.

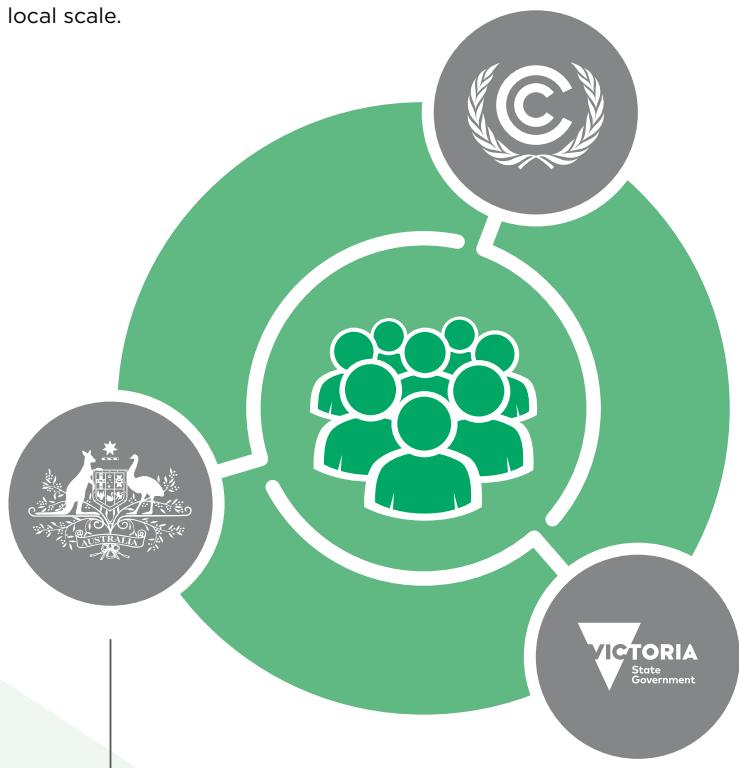
Thunderstorm Asthma

The 2016 **thunderstorm asthma** events in Melbourne resulted in the death of eight people and serious health impacts for thousands more. The unusually wet spring led to an abundance of grass pollens which, combined with a sudden cool change and thunderstorm, triggered severe asthma for thousands of people. Melbourne's health systems were stretched beyond capacity in places, with seven times the normal number of ambulance calls, and a shortage of asthma medication in some locations. This event was unexpected and highlights how new impacts can manifest any time.



Policy and regulatory changes apply at global, national and state levels

The importance of climate change adaptation is increasingly recognised at the international, national, state and local scale.



Australian Government

At the national level, the Australian Government's National Climate Resilience and Adaptation Strategy, released in 2015, sets out how Australia is managing climate risks for the benefit of the community, economy and environment. It identifies a set of principles to guide effective adaptation practice and resilience building, and outlines the Government's vision for the future.

United Nations

The importance of adaptation is recognised on the international stage. The United Nations Framework Convention on Climate Change (UNFCCC) acknowledges that adaptation efforts are as important as reducing greenhouse gas emissions. The UNFCCC Paris Agreement, which came into force in late 2016, provides further context for action at all levels of government. The Paris Agreement in particular recognises the critical role of cities through their efforts to reduce emissions, build resilience and decrease vulnerability to the adverse effects of climate change.

In 2015, the United Nations, as part of its 2030 Agenda for Sustainable Development, committed to 'taking urgent action to combat climate change and its impacts (Sustainable Development Goal 13)'. It also adopted various measures to increase climate change adaptation efforts as part of its New Urban Agenda in January 2017.

Victorian Government

In February 2017, The Victorian Parliament passed the Climate Change Act Bill 2016 to bring into effect a new Climate Change Act. The new Act will implement long-term mitigation targets and a stronger commitment to adaptation action.

The Victorian Government also released its second statewide climate change adaptation plan. Victoria's Climate Change Adaptation Plan 2017-2020 provides a blueprint for action to help Victoria meet the challenges and act on the opportunities of climate change. It supports and acknowledges the work of local governments in helping their communities adapt.

Figure 3: Australian and International policy context

Our community wants action

In late 2016, the City of Melbourne released Future Melbourne 2026, a plan that details the community's aspirations for the city synthesised into nine key goals. The plan was informed by contributions from thousands of people. Future Melbourne 2026 has 'A city that cares for its environment' as Goal 1, elevated from Goal 5 in 2008. The community has reaffirmed the importance of ecological sustainability and climate change adaptation by having the first priority as 'maintain the urban biosphere' and the second priority 'adapt for climate change'.

The Climate Change Adaptation Strategy was refreshed with the guidance of community feedback.

Following Future Melbourne 2026, we sought further input from the community through:

- A discussion paper and online survey via the Participate Melbourne website. We received 23 submissions during the four-week engagement period in August 2016.
- Community workshops and a public drop-in session. 65 people attended these workshops.
- Internal workshops and drop-in sessions to harness the diverse expertise across 19 internal branches of our organisation.
- A stakeholder workshop, which included 25 people from business, government and academia.
- Individual meeting with key stakeholders.

The consultation process aimed to identify challenges and solutions to addressing the impacts of climate change. The community identified Melbourne's key challenges as the enhanced urban heating due to the hard built surfaces in the city (the urban heat island effect) and severe flood events. People were most concerned with the impacts of these challenges on vulnerable parts of the community, the city's plants and animals, the way we travel to and from work and our general social wellbeing.

To respond to these challenges, community members proposed to increase green, permeable spaces in the city, strengthen social connectedness, and support vulnerable populations. The community also suggested that this strategy should promote the retrofitting of the city's infrastructure and the design of new buildings to better cope with extreme weather events.

The Climate Change Adaptation Strategy Refresh Community Engagement Summary Report summarises the community's feedback.

2.2 Best practice in city climate change adaptation leadership

In cities, people can work together to help minimise harm and make the most of opportunities while adapting to climate change through using social networks, and nature-based and engineering solutions. These include green roofs, spaces, walls and laneways, stormwater capture systems, and upgrading drainage infrastructure to tackle risks associated with urban heat and flooding. This collaborative approach builds new social connections and help spread ideas, reducing people's vulnerability to climate change.

Since the City of Melbourne's first Climate Change Adaptation Strategy was released in 2009, many cities around the world have further developed their approach to climate change adaptation. Their innovative actions have created a wealth of technological and other practices we can learn from.

Blue infrastructure, Rotterdam

Rotterdam in the Netherlands stands out as a global leader in climate resilience and sustainable urban design. In response to sea level rise and increases in rainfall and flooding events, the city piloted an innovative above ground water storage system called Bentemplein Water Square. Made up of several connected basins, the squares function as both floodable infrastructure and outdoor sports courts. The Water Square forms an important part of the city's flood management and shows how flood retention can be integrated into and form part of the identity of a built city. It is featured in the city's Climate Change Adaptation Strategy as an example of how to 'climate proof' the city (City of Rotterdam, 2013).

Developing a water square in Melbourne could play a role in managing more frequent flash floods in densely built-up areas.



Bentemplein Water Square, Rotterdam Source: Gemeente Rotterdam



Green roof in New York City Source: New York City Department of Environmental Protection

Green Infrastructure, New York City

As part of its climate adaptation strategy, 'A Stronger More Resilient New York,' New York City introduced the Green Roof Tax Abatement to help realise the potential of green roofs in cooling, absorbing stormwater, reducing noise and air pollution and creating a green environment for wildlife. The abatement reduces property taxes by \$5.23 per square foot of green roof,

up to \$200,000, to encourage building owners to install green roofs. The program has been successful in increasing green roof coverage.

In Melbourne, innovative finance mechanisms may also have a role to play in the uptake of green roofs across the central city and support an emerging industry.

Olympic Games Urban Renewal and Regeneration, London

The 2012 London Olympic Games provided a transformative opportunity to regenerate undervalued land while committing to the promise of creating a high-quality, vibrant and resilient new area for London. Surrounded by a network of rivers, with poor water quality, flood risk and heavily contaminated groundwater, the London Olympic Park area was redeveloped to improve community amenity beyond the Olympic Games. Climate change adaptation was central to the design of the waterfront park, which is used as a flood defence to maintain protection for a 1 in 100 year flood. The project generated multiple benefits, providing a valuable wetland habitat and creating a public open space for residents to use.

Melbourne has a number of urban renewal sites, where similar design principles could be used to accommodate sea level rise, manage flooding, and increase urban biodiversity.

Cloudburst Master Plan, Copenhagen

A major rainfall event in the city of Copenhagen in 2011, initiated the development of an innovative, catchment-based 20-year master plan. The downpour, which consisted of 150 mm in two hours, caused damage to critical infrastructure and close to \$1 billion euros in insurance claims. The Cloudburst master plan protects the city against future heavy rainfall through the implementation of 300 dual function projects that enhance the quality of life of the people of Copenhagen. It incorporates blue and green infrastructure into the planning process. Amenities such as recreational, mobility and biodiversity areas are used for flood mitigation. The City of Copenhagen worked with local communities to identify areas for water detention. The master plan is funded through a water tax. The implementation of the master plan reduces the risk from flooding resulting in residents receiving a decrease in their insurance premiums and in some cases properties that were not insurable can now be insured. The work provided 660 million euros of socio economic benefits.

Local government has an important role

Local governments in cities are at the heart of adaptation action. They:

- Can directly influence the shape of the built form and infrastructure used by more than 50 per cent of the world's population every day.
- Are responsible for managing significant assets and delivering many types of services.
- Have a privileged understanding of, and access to, their communities through the direct services they provide.
- Have established relationships with many important local stakeholders that can become drivers of climate change adaptation.
- Receive a direct mandate from their communities to prepare for extreme events that severely impact them and their environment.
- Melbourne is part of a global community of connected cities, businesses and individuals who lead the way in climate adaptation.

CITIES PARTNERING ON CLIMATE CHANGE ACTION

Melbourne is working with other cities across the world to lead the way in climate change adaptation

The C40 Cities Climate Leadership Group (C40) is demonstrating cities' commitment to reduce greenhouse gas emissions and climate change adaptation. Through C40, Melbourne works with global cities, sharing best practices. Many cities within the C40 network have published ambitious adaptation plans and implemented inspiring solutions.

Melbourne is a member of ICLEI – Local Governments for Sustainability and ICLEI's Global Executive Committee. ICLEI represents more than 1,500 cities, towns and regions committed to building a sustainable future, with a resilient cities agenda. Melbourne is also a participant to the Compact of Mayors. The Compact is led by the world's global city networks – C40, ICLEI and the United Cities and Local Governments (UCLG) – with support

from UN-Habitat, the UN's lead agency on urban issues. The Compact captures the impact of cities' collective actions through standardised measurement of emissions and climate risk, and consistent, public reporting.

Pioneered by the Rockefeller Foundation, the 100 Resilient Cities initiative is helping Melbourne and cities around the world become more resilient to physical, social and economic challenges. The Resilient Melbourne Strategy was released in 2016 and the City Of Melbourne is one of the 32 metropolitan Melbourne councils that have endorsed this strategy.

Locally Melbourne is a partner council in the Inner Melbourne Action Plan 2016-2026 (IMAP) along with the municipalities of Port Phillip, Stonnington, Yarra and Maribyrnong. IMAP priorities have been shaped in response to the Victorian Government's, Plan Melbourne.

2.3 We have made progress but there is more to do

Melbourne's climate change risks remain significant

In our 2009 Climate Change Adaptation Strategy, we identified four main climate change risks for Melbourne: insufficient water supply, floods, heatwaves and storms. The risk assessment in 2009 was the first of its kind in Australia and helped shape climate change risk assessment approaches globally.

As part of this refreshed strategy, we reviewed the identified risks, to assess whether they were still accurate and relevant. We took into account updated climate change projections, major trends in the municipality – population growth, housing densification, environment and social inequality – and significant changes in risk management strategies.

The review showed that the existing risks – insufficient water supply, floods, heatwaves and storms – remain a priority for action and focus. It also showed that through embedding adaptation in our business processes

(such as capital works approval and annual planning processes) and day-to-day operational risk management, we are proactively addressing our climate change risks.

The risks can be clustered in four broad themes (as shown in Figure 4).

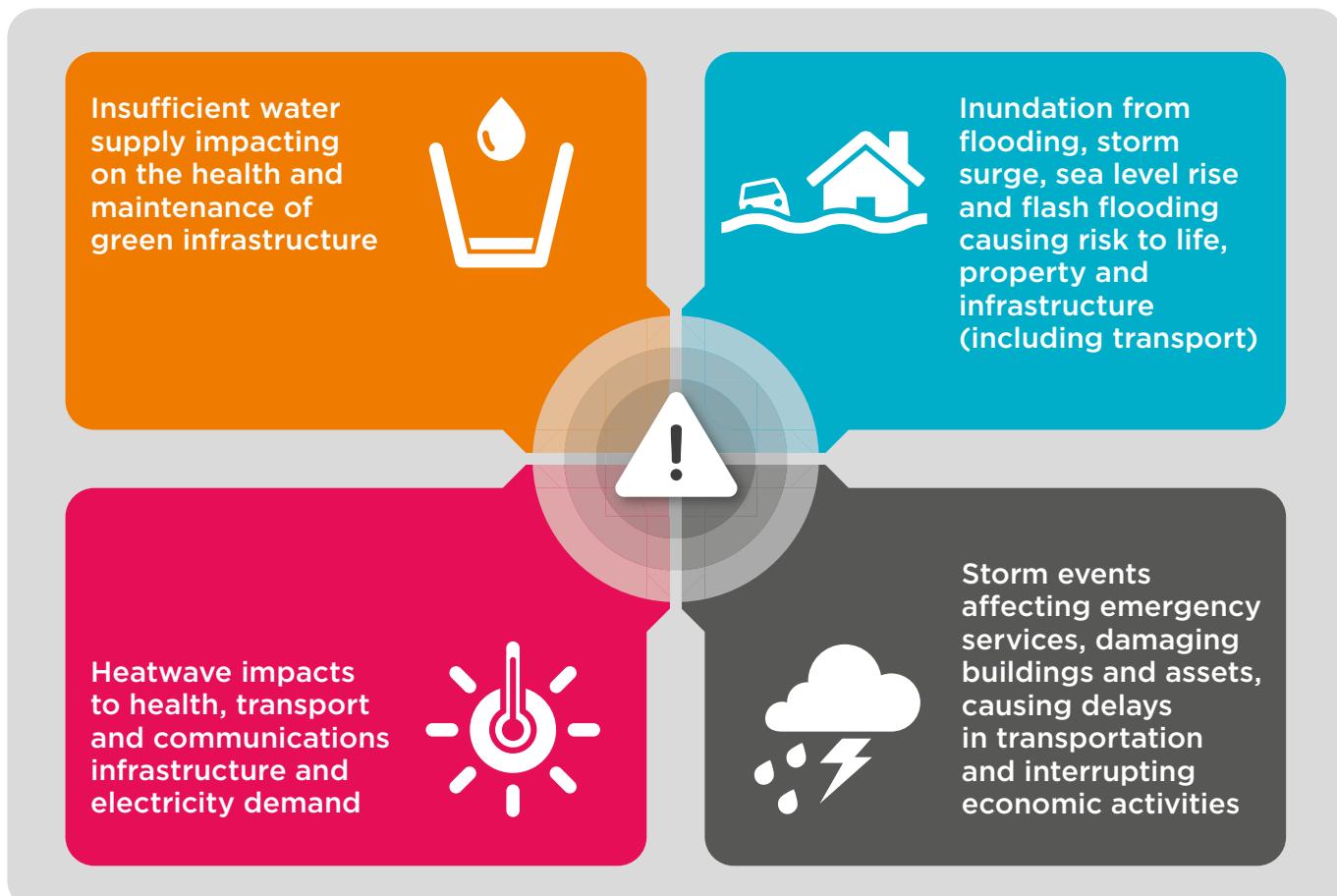


Figure 4: Risk Clusters

Our achievements to date

The City of Melbourne's achievements in climate change mitigation and adaptation have been recognised nationally and internationally, including through the C40 Climate Leadership Awards.

Our Zero Net Emissions Strategy (2003, and refreshed in 2008 and 2014) sets clear, objectives to reduce our greenhouse gas emissions and to maintain carbon neutrality for our operations. We also set an ambitious objective to achieve zero net emissions for the municipality by 2020.

Recognising that climate change is occurring despite our own efforts and those of others to reduce emissions, we also formalised our commitment to prepare for the impacts of climate change through our Climate Change Adaptation Strategy – the first of its kind in Australia. The 2009 strategy and its associated Climate Change Adaptation Action Plan 2010 drove the implementation of over 100 climate change adaptation actions.

As part of the strategy refresh, we have reflected on the effectiveness of our planning, preparation and response to the four main climate change risks across our communities. Our work has deliberately taken advantage of opportunities to implement actions.

For example, when assets such as roads or parks are being renewed, we implement increased permeability, stormwater storage or green infrastructure.

We need to continue to take advantage of these opportunities, and also to plan strategic interventions based on risk and vulnerability. We do this well in our Urban Forest Strategy Precinct Plans, using extensive data on heat, demographics, existing tree health, appropriate species selection and community priorities to determine our planting regime. These Plans have been enhanced by our recent research into the suitability of different tree species to a changing climate.

La Trobe Street green bicycle lane

When we separated the bicycle lanes from the road on La Trobe Street, we chose to add climate adaptive features like greenery and increased permeable surfaces. The project was a key action in our Bicycle Plan 2012-16. At the same time, the Urban Forest Strategy and other city precinct plans highlighted La Trobe Street as an area that would benefit from increased tree canopy. The integration of bicycle and green infrastructure shows how strong planning can efficiently achieve multiple community benefits.



Stormwater capture and reuse at Fitzroy Gardens

In response to the Millennium Drought, a stormwater harvesting system was installed at Fitzroy Gardens in December 2013. The system provides 70 million litres of water every year, and helps us keep the heritage garden healthy in a changing climate, in which prolonged droughts and more frequent heatwaves are expected.



Managing and building a resilient drainage system

We are planning the municipality's drainage maintenance and capital works programs to respond to high rainfall events. Total Watermark: City as a Catchment has a target to upgrade our drainage network to cater for a 1 in 20 year flood event by 2030. To test how our network might perform under climate change, we built a comprehensive database of the drainage network using video capture and area-specific studies. We are now using our in-depth knowledge to proactively manage our network to cope with storm events.

Productive partnerships

The Inner Melbourne Climate Adaptation Network has helped bring together a range of government, business and community stakeholders who play vital roles in addressing climate change risks in Melbourne. The network ensures sharing of knowledge and better coordination across neighbouring councils, large landholders and service providers.

The City of Melbourne is also on the Fishermans Bend Taskforce (the Taskforce), which was established in January 2016 to lead the planning of the area on the recommendation of the Ministerial Advisory Committee. The Taskforce also comprises members from Places Victoria, the Department of Environment, Land, Water and Planning, and the City of Port Phillip. The Taskforce

is working with the Ministerial Advisory Committee, the community and stakeholders to develop a blueprint for Fishermans Bend that will transform it into a place for everyone.

In addition we work closely with the Victorian Planning Authority on the development of Arden Macaulay as well as being on a range of interdepartmental committees. We have Memorandum of Understandings with the Department of Environment, Land, Water and Planning and the Department of Economic Development, Jobs, Transport and Resources. These strong working relationships help us ensure that decisions made by others, particularly as we plan for significant urban renewal in our municipality, contribute to the best outcomes for the city.

Opportunities to strengthen our climate change adaptation approach

We have come a long way since our 2009 strategy, but there are still further opportunities to strengthen our adaptation response. Reviewing our Strategy identified areas where we need to do more work (refer to Appendix 1 for this analysis). We have achieved a lot and we need to build on our existing work and also implement new climate change adaptation actions.

Areas needing more focus include:

- Engagement with small and medium businesses to increase their resilience.
- Partnering with other organisations and agencies that have responsibilities within the city.
- Increased collaboration to use a multidisciplinary approach in making business as usual decisions in climate change adaptation.
- Evaluation of our actions and process.
- Further incorporating adaptation considerations into future planning, in particular in urban renewal precincts to prepare for flooding and inundation.
- Appropriately greening the city in both the private and public realm.
- Increased understanding of the effectiveness of our adaptation actions.

New opportunities to address the key challenges include:

- Increasing permeable surfaces within the municipality to reduce the impact of flooding.
- Providing incentives to the public realm to increase green infrastructure across the city.
- Developing extreme weather plans to ensure appropriate and inclusive support is provided to vulnerable communities during extreme weather events.
- Working with small businesses to help them plan for the impacts from extreme weather events.
- Actively monitoring and evaluating our adaptation actions to improve our understanding of their effectiveness. This will also identify new opportunities to address challenges.

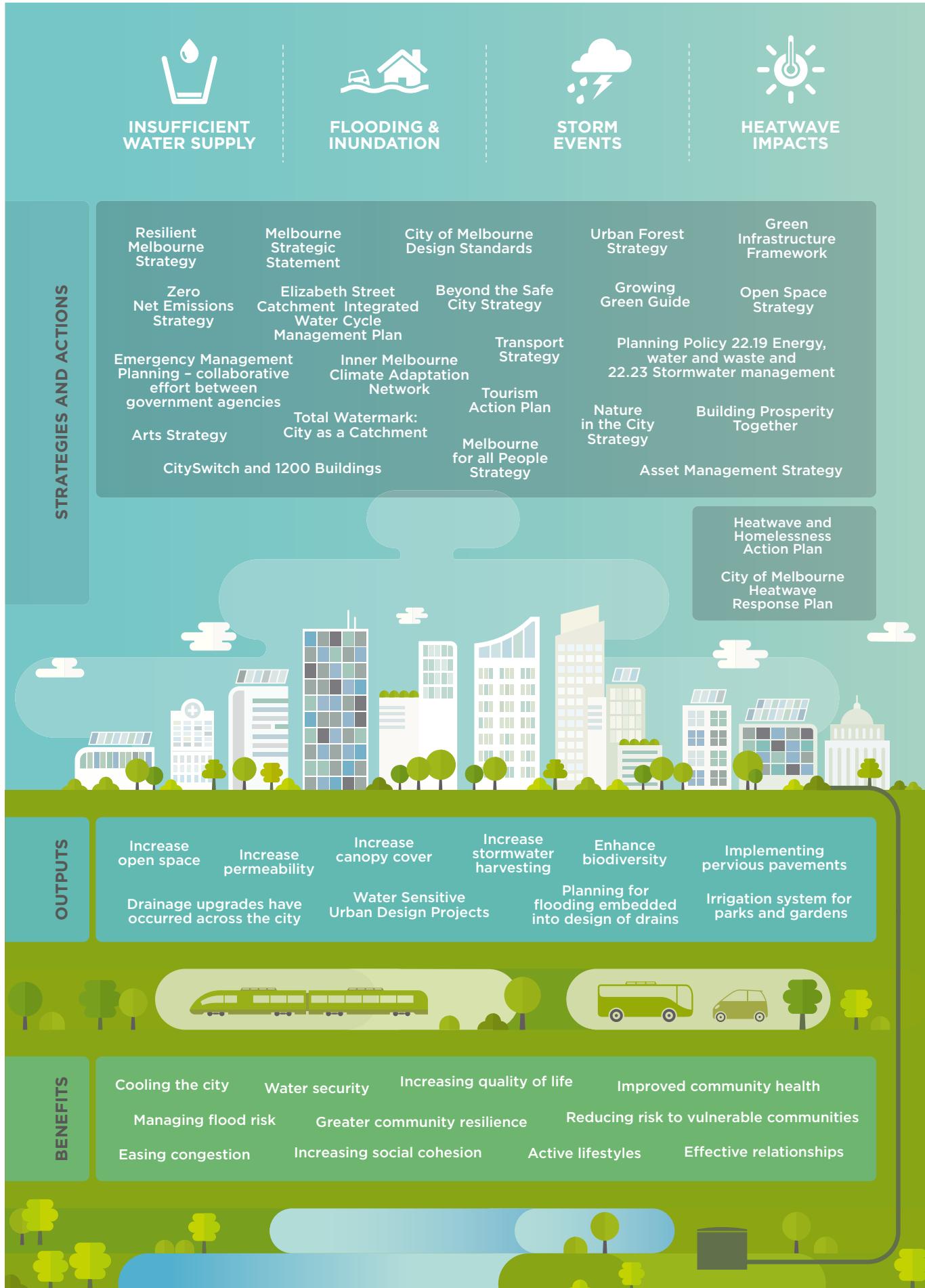


Figure 5: Our current work in climate change adaptation and the outputs and benefits they provide



3. WE NEED A STRONGER PARTNERSHIP APPROACH

There are many players making changes in our city, and their decisions will also affect how resilient our city is to climate change. We need to work with partners more effectively to ensure we protect Melbourne's citizens and achieve the potential economic, social and environmental co-benefits that planning for climate change can achieve.

As the climate continues to change and as our population grows, we need to continue the work that we have been doing and also increase our focus on the key challenges.

The key challenges requiring further work and focus are:

1. Inundation from floods and sea level rise.
2. Increase greening in the city, including green roofs, walls, facades, open space and urban forest in both the public and private realm.
3. Emergency response to heat and storms.
4. Insurance and resilience of small business.
5. Embedding climate change adaptation in the work that we do.

We cannot tackle these challenges alone. We need to ensure that our efforts are aligned, complementary, and achieve multiple benefits. Working in partnership with local, Victorian and Australian Governments, agencies and other organisations will allow us to deliver adaptation action more broadly across the municipality.

We need to achieve the climate-related initiatives of the Melbourne Resilience Strategy, within our own municipality and in partnership with Greater Melbourne region councils and Emergency Management Victoria. This includes taking action in areas such as insurance, urban forest, integrated water management, community resilience, working with small to medium businesses and improving social cohesion.

By introducing funding mechanisms such as the urban forest fund we can help encourage greening of the private realm.

We need to work closely with Melbourne Water and the water retailers to achieve the level of flood mitigation and management that will protect our communities and enable safe and effective growth into low lying areas. Planning for integrated water management will achieve benefits including open space that perform multiple functions for recreation, environmental protection, water and flood management and community and economic activation.

We need to work more closely with Victorian Government agencies so planning and development in urban renewal areas considers sea level rise, flood management, increased canopy cover, heat refuges, green roofs and walls, and enhanced permeability, whilst creating economic and social benefits for our growing populations of residents and workers.

“DELWP is proud to partner with the City of Melbourne. We’re leading together to prepare and adapt our great city for the challenges of climate change. By working together we can protect what we all love about Melbourne – it’s a great place to live, work and visit”.

Adam Fennessy, Secretary of Victorian Government Department of Environment, Land, Water and Planning (DELWP)



4. OUR NEW VISION, GOALS AND PRINCIPLES

Our vision, goals and principles are based on the priorities expressed by the community through Future Melbourne 2026 and supported by our risk assessment, experience, and best climate change adaptation practices. Adapting to climate change requires ongoing adjustments, as we continue to learn about and monitor the changes in our climate.

Principles

- Continue to act as a global leader in climate change adaptation across our city. By modelling the way, we can inspire action from neighbouring municipalities and local and international stakeholders.
- Build effective partnerships with service providers, the private and public sectors and those who live, work or play in our city. In doing so we can draw on existing skills, expertise and networks to deliver increased resilience for our community.
- Drive innovation in adaptation, by remaining open to experimentation and continuing to push boundaries.
- Freely and transparently share knowledge, innovations and lessons learned.
- Prioritise adaptation actions that deliver multiple benefits to our community.

VISION

Melbourne is adapting well to climate change so it can continue to prosper and thrive

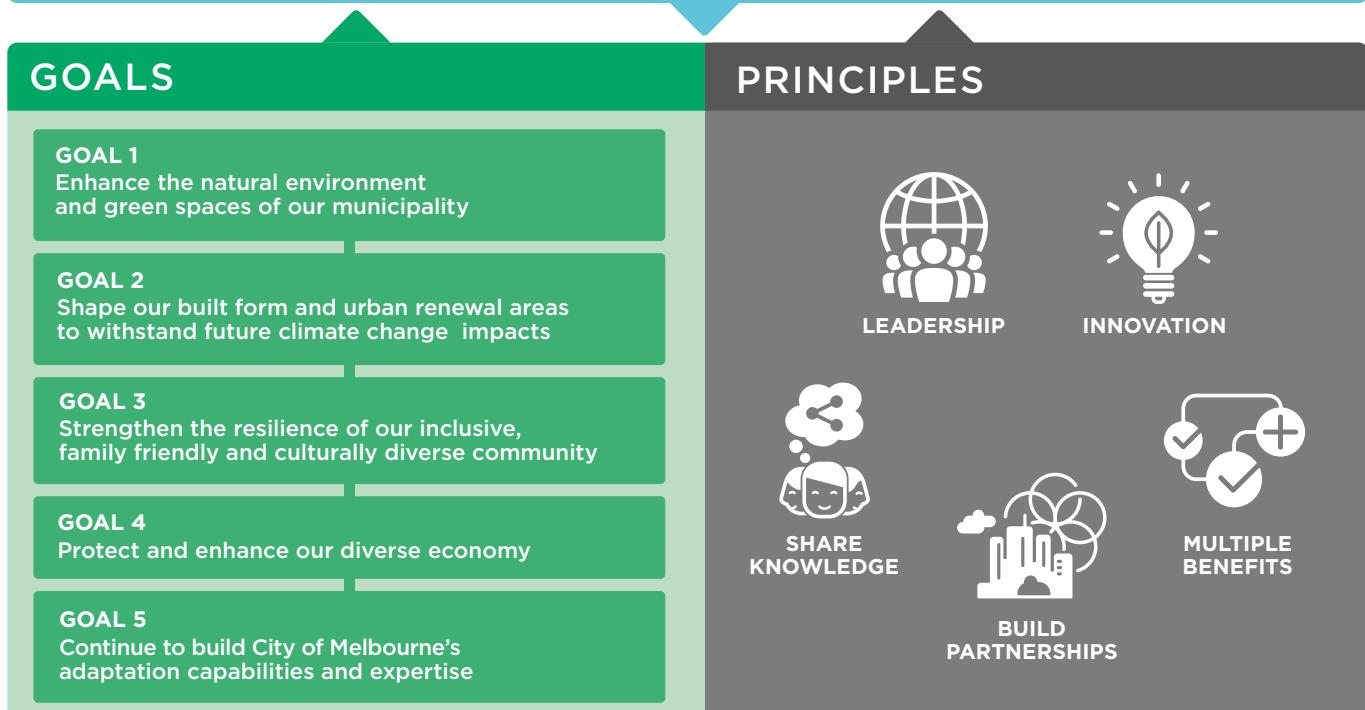


Figure 6: Vision, goals and principles

Goal 1: Enhance the natural environment and green spaces of our municipality

Our natural environment is at risk from the impacts of climate change. Reduced rainfall, more frequent heatwaves and droughts will stress and damage the city's parks and gardens, street trees, grasses and wetlands. Impacts of climate stress have already been observed in our city's green spaces.

Protecting our healthy ecosystems and rich biodiversity helps maintain clean air and water and improves physical and mental wellbeing. It also provides substantial adaptation benefits. Retaining water in the urban environment, expanding our green spaces, installing temporary shade spaces and increasing our tree canopy all help to cool our municipality. Many of these initiatives also help reduce flash flooding risks.

By considering our city as one connected ecosystem, we can actively foster connections between people and the environment, to create a more balanced, resilient, healthy and adaptive urban environment.

Current actions and key gaps

We are already enhancing our natural environment and have set ambitious targets through the Growing Green Guide and our Urban Forest, Total Watermark: City as a Catchment, Open Space, and Nature in the City strategies. Outputs from these strategies include increasing stormwater harvesting, increasing green space, doubling canopy cover, increasing permeability and enhancing biodiversity across the city.

All of these efforts combined aim to cool Melbourne by four degrees, which will improve liveability, resilience, and community health and help maintain biodiversity. Over the past five years we have spent over \$50 million dollars to implement these actions and it is

anticipated that this level of expenditure will continue into the foreseeable future. We will continue to build on these strategies, taking the latest climate change information into account.

We also need to encourage greening of the private realm and to incorporate latest research into park design and vegetation selection. We can expand our ambition and look to global examples of best practice, such as mandating green roofs or solar installations for new developments, as is already required in Copenhagen, San Francisco, Cordoba, New York and Paris. Such ambitious actions will help transform Melbourne into a green, thriving and linked city ecosystem, increase the city's long term resilience, and ensure it remains one of the most liveable cities in the world.



Actions: What we will do to enhance our natural environment and green spaces

	ACTION	DELIVERY MECHANISM	TIMEFRAME	BUSINESS IMPACT
1.1	<p>Partner to deliver on Resilient Melbourne Strategy, Inner Melbourne Action Plan and Flood Management Strategy Port Phillip and Westernport with a particular focus on:</p> <ul style="list-style-type: none"> • Enabling better use of existing water resources, and reducing our exposure to drought, extreme heat and flood, by developing decision-support tools that encourage water sensitive urban design and integrated water management. • Sharing and extending the objectives of the Urban Forest Strategy to the metropolitan Melbourne area. • Addressing flood risks and extreme heat to reduce impact and get the best social, economic and environmental outcomes. 	Partner with the Victorian Government and surrounding councils	Ongoing	Business as usual budgets
1.2	Partner with the Victorian Government to implement nature-based solutions, such as green infrastructure and water sensitive urban design in our urban renewal areas, in line with our Total Watermark: City as a Catchment, Urban Forest, Open Space and Nature in the City strategies.	Partner and advocate	Ongoing	Advocacy in existing budget, projects subject to business case
1.3	Identify opportunities in existing open space to incorporate latest research and best practice to ensure urban landscapes can adapt to future climate. New open space will be designed to incorporate best practice and latest research in adaptive design.	Deliver	Ongoing	Business as usual budgets & processes
1.4	Encourage and support the uptake of nature-based solutions in the private realm linking outcomes with targets in our existing strategies, through mechanisms such as the Urban Forest Fund to co-finance additional greening.	Partner and advocate to private sector	Ongoing	Business as Usual and subject to annual plan budget and business case
1.5	Implement findings of 2016–17 Council Plan action to encourage green roofs and solar installations.	Deliver	From 2017	Subject to annual plan and budget
1.6	Undertake research to further understand the broad range of benefits that green infrastructure, parks and nature bring to the city.	Deliver	From 2017	Business as usual budgets & processes

Goal 2: Shape our built form and urban renewal areas to withstand future climate change impacts

Climate change impacts critical infrastructure and our broader built environment. It has the potential to disrupt the services dependent on this infrastructure, through damage caused by flooding, heatwaves and other types of extreme weather.

The way we build our city also contributes to how well it responds to climate events. For example, a high proportion of sealed and dark surfaces contribute to flash flooding and the Urban Heat Island effect.

As we experience more days of extreme heat, the thermal comfort of accommodation including high-rise apartments is imperative. During extreme heat we can face periods of power outages, which means lifts in apartment buildings or air conditioning will not function and this can greatly impact human health and wellbeing.

Melbourne's built environment is

Actions: What we will do to shape our built form and urban renewal areas to withstand future climate impacts

experiencing dynamic shifts, driven largely by significant increases in population. This growth is being matched by investments in infrastructure and construction, including large-scale urban renewal projects like Fishermans Bend, Arden Macaulay, West Melbourne and the Melbourne Metro Rail project.

These developments provide exciting opportunities to ensure our new suburbs and infrastructure are resilient to climate change, incorporating best practice adaptive design now while saving substantial retrofit costs in the future. We need to harness these chances to enhance our city's existing built assets and infrastructure to manage impacts from climate change.

A resilient built environment is essential to good quality of life. Providing reliable, well integrated, services – transport, water and energy – in the face of a changing climate will allow Melbourne to become a city that is always ready for the future.

Current actions and key gaps

We are already improving our built environment through the way that we create and manage our assets and

implement strategies such as Total Watermark: City as a Catchment and Urban Forest Strategy. We have set strong targets on stormwater capture and reuse and we are improving our drainage system to respond to 1 in 20 year rainfall events. We plan to double our canopy cover by 2040.

The City of Melbourne has integrated water sensitive urban design into our planning scheme through Planning policy 22.23 Stormwater Management (WSUD), and Melbourne Planning Scheme Local Policy 22.19 Energy, water and waste efficiency. We have also integrated climate change considerations into our Asset Management Strategy 2015-2025, recognising the vulnerability of Melbourne's infrastructure, particularly in relation to drainage and irrigation. Currently, the city has a high proportion of sealed surfaces. We will work to increase permeability to help mitigate flooding and cool the city.

We can also learn from other cities' best practice approaches in infrastructure adaptation, including Washington DC's Buzzard Point Urban Design Framework that considers climate a key influencer of urban renewal projects. We must do the same to ensure our urban renewal areas are well adapted to climate change.

	ACTION	DELIVERY MECHANISM	TIMEFRAME	BUSINESS IMPACT
2.1	<p>Partner to deliver the Resilient Melbourne Strategy, Inner Melbourne Action Plan and Flood Management Strategy Port Phillip and Westernport with a particular focus on:</p> <ul style="list-style-type: none">Enabling better use of existing water resources, and reducing our exposure to extreme heat drought and flood, by developing decision-support tools that encourage water sensitive urban design and integrated water management.Sharing and extending the objectives of the Urban Forest Strategy to a wider metropolitan Melbourne Area.Addressing flood risks to reduce impact and get the best social, economic and environmental outcomes.	Partner with the Victorian Government and surrounding councils	Ongoing	Business as usual budget

	ACTION	DELIVERY MECHANISM	TIMEFRAME	BUSINESS IMPACT
2.2	Partner to create a precinct in the Elizabeth Street catchment that is water sensitive, low carbon and well adapted to climate change.	Partner with Resilient Melbourne, Melbourne University and CitiPower	2017-18 Council Plan action	Business as usual budgets
2.3	Work with key partners to develop climate change adaptation plans for urban renewal precincts. Advocate for area-specific recommendations for climate change adaptation to be incorporated into planning and development.	Advocate	From 2017	Business as usual budgets
2.4	Conduct a vulnerability assessment of City of Melbourne owned buildings to identify actions that can improve building performance in extreme weather and incorporate thermal comfort, drainage, and water storage considerations into building retrofit designs. Share the assessment process and results with building owners across the city to improve building performance in the entire municipality.	Deliver	From 2017	Business as usual budget for 2017-18 2018 onwards subject to annual plan and budget, or business case
2.5	Screen and update existing City of Melbourne design standards for all climate hazards to ensure resilient, adaptive and fit-for-purpose infrastructure and buildings.	Deliver	Medium term	Subject to annual plan and budget
2.6	Investigate current obstacles to planning policy use and application for achieving adaptation outcomes. Amend the Municipal Strategic Statement to include specific objectives, minimum standards and performance measures for climate change adaptation in the municipality's built environment.	Deliver	2017-18	Business as usual budget
2.7	Build on existing decision-making tools to help identify and prioritise opportunities and locations to implement new adaptation infrastructure across the municipality. Use these tools to develop a pathways planning approach for the municipality to address the dynamic risks of flooding and inundation.	Deliver	From 2017	Business as usual budget for 2017-18 2018 onwards subject to annual plan and budget, or business case
2.8	Investigate innovative integrated water management solutions to improve flood mitigation urban renewal areas. For example this could include piloting a 'water square' in new or upgraded development areas to manage the risks of flooding.	Partner with Melbourne Water, Victorian Government	Ongoing	Investigation in existing budget, capital projects subject to business case
2.9	Partner with key stakeholders to identify and develop opportunities for increasing energy security and resilience to electricity failures.	Partner with CitiPower	Ongoing	Business as usual budgets
2.10	Increase permeability across the municipality by introducing place-based permeability targets, building on those already in the Elizabeth Street Catchment Integrated Water Cycle Management Plan.	Deliver and Partner	From 2017	Business as usual budget for 2017-18

Goal 3: Strengthen the resilience of our inclusive, family friendly and culturally diverse community

Our community will experience a range of shocks and stresses as a result of climate change. Extreme weather and prolonged droughts will have health and wellbeing implications for residents and visitors, and present a range of challenges to businesses and groups.

The need for adaptation action is particularly pressing for vulnerable people within the community, including those experiencing homelessness, the elderly, young children, international students, people with disabilities and low-income households. There is significant socio-economic disadvantage in our municipality, with approximately 18.7 per cent of residents living below the poverty line, and over 1200 people experiencing homelessness. These groups are more vulnerable to climate change impacts.

Maintaining an inclusive, culturally diverse community that provides for people of all ages will require strengthening and enabling community resilience to climate impacts. Working with those who are likely to be disproportionately impacted by climate change is essential to maintain and improve social cohesion. As a major provider of community services, we also need to plan for potential demand growth due to climate change impacts.

The creative industries also have a part to play in enabling community resilience to climate change. Art installations and music events, which teach people about climate change impacts, can be very powerful and engaging. Cultural and creative events have a number of other benefits for the community, too, including celebrating diversity, encouraging innovation, and providing a sense of joy and inspiration.

Current actions and key gaps

Several of our strategies that complement this goal, including: Melbourne for all People 2014, Heatwaves and Homelessness 2014 and the Arts Strategy 2014. However, more needs to be done to better focus community efforts on resilience to climate change.



Actions: What we will do to strengthen the resilience of our inclusive, family friendly and culturally diverse community

	ACTION	DELIVERY MECHANISM	TIMEFRAME	BUSINESS IMPACT
3.1	<p>Partner to deliver the Resilient Melbourne Strategy and the Inner Melbourne Action Plan with a particular focus on:</p> <ul style="list-style-type: none"> Establishing a metropolitan bicycle path network to provide safe and comfortable riding routes. Working with emergency management agencies to achieve EMV's vision of 'safer, more resilient communities.' Creating cool public spaces and travel routes. Support further development of insurance education programs to increase knowledge and awareness on managing risk for stakeholders and community. Continue to develop innovative and sector leading extreme weather plans to ensure appropriate and inclusive support is provided to vulnerable communities. 	Partner with the Victorian Government and surrounding councils	Ongoing	Business as usual budget
3.2	Develop additional techniques for cooling public spaces and communicate to workers, residents and visitors the location of these cool places using innovative techniques.	Partner with Resilient Melbourne Office	2017 onwards	Investigation in existing budget, capital projects subject to business case
3.3	Work with stakeholders, including emergency management to deliver Refuge, a five-year interdisciplinary project exploring the role of art and culture in preparing communities for climate related impacts.	Deliver and partner	2017-18 Council Plan action 2018 onwards subject to annual plan and budget, or business case	Business as usual budget for 2017-18 2018 onwards subject to annual plan and budget, or business case
3.4	Provide tailored support to vulnerable communities, residents, workers, communities and visitors to address all climate risks through information provision, education programs and extreme weather plans.	Deliver	Ongoing	Business as usual budgets
3.5	Advocate to the Victorian Government to address climate vulnerability among public housing tenants and engage with programs that promote climate risk consideration in the community sector.	Advocate and partner with Victorian Government	Ongoing	Business as usual budgets
3.6	Improve and enhance the consideration of climate risks in public event management, strengthening contingency planning and use of adaptation measures such as cooling systems and access to alternative venues during extreme weather events.	Deliver and advocate	Ongoing	Business as usual budgets

Goal 4: Protect and enhance our diverse economy

We want to create a diverse economy, which supports not only the wealthy but also the most vulnerable members of the community, and enables resilience to climate change impacts.

The municipality's economy represents a gross local product of \$90.6 billion and more than 450,000 jobs (<http://melbourne.geografia.com.au/>). In order to ensure the continuing economic prosperity of our municipality, businesses must be prepared for the risks associated with climate change impacts, increasing their flexibility and adaptability.

Under the Corporations Act, directors have a duty to apply care and diligence in considering all the risks that might apply to their company. They are required to take into account all 'foreseeable' risks and this includes climate change, according to recent legal advice commissioned by the

Centre for Policy Development and the Future Business Council, titled Climate Change and Directors Duties.

Protecting Melbourne's diverse economy to perform well in the face of climate change has a huge range of immediate benefits to the community. It helps maintain access to jobs. It also allows us to deliver world leading sports and cultural events, and to increase the city's vibrancy – all things our community values about Melbourne.

Current actions and key gaps

Other City of Melbourne strategies complement and overlap with this goal, including: Building Prosperity Together, and the Tourism Action Plan (2016). We need to do further work to reduce specific climate change risk to our local economy.

It is also important for the public and private sector to identify the business opportunities associated with climate change.

Small to medium businesses need information to understand how climate change might impact their business and how they might lessen this impact. The Resilient Melbourne Strategy and the Inner Melbourne Action Plan both focus on providing information to small to medium businesses. We will work in partnership with the Resilient Melbourne Office to help businesses within our municipality.

In Victoria's Climate Change Adaptation Plan (2017), recently published by the Department of Environment, Land, Water and Planning, the importance of the link between local governments and other organisations is highlighted. In a coordination role, the Victorian Government will host a forum on managing climate-related insurance risks to bring together local governments and the private sector, specifically the insurance industry.

Actions: What we will do to protect and enhance our diverse economy

	Action	Delivery Mechanism	Timeframe	Business Impact
4.1	<p>Partner to deliver the Resilient Melbourne Strategy and the Inner Melbourne Action Plan with a particular focus on:</p> <ul style="list-style-type: none">• Providing information and resources to help Melbourne's small to medium businesses prepare for future impacts of climate change.• Engaging with networks of business, government and community events to build businesses knowledge of planning and preparing for extreme weather events.	Partner with the Victorian Government and surrounding councils	Ongoing	Business as usual budgets
4.2	Partner with the insurance industry and the Victorian Government to explore options for finance mechanisms that strengthen the business case to leverage funds for adaptation and maximise climate risk management and adaptation across the municipality.	Partner with Resilient Melbourne Office, Victorian Government and the Insurance Industry	Ongoing	Business as usual
4.3	Identify opportunities to co-finance adaptation projects for example through public/private partnerships to achieve multiple benefits.	Partner with insurance industry and urban renewal agencies	Ongoing	Subject to annual plan and budget and business case

Goal 5: Continue to build Melbourne's climate change adaptation capabilities and expertise

The City of Melbourne is leading on climate change action – in Melbourne, in Australia and globally. We are working to continually improve the municipality's capabilities and expertise, drive innovation and engage the community in a collective response to climate change.

Strong governance structures underpin our commitment to showcasing leadership. We want to continue to build our own adaptation capabilities and expertise, as well as the expertise of our partners and the community.

Current actions and key gaps

We are informing and involving the community through Participate Melbourne and Future Melbourne, to encourage community-led responses to climate change.

The City of Melbourne has a strong track record in using new tools to analyse and share information that builds our capacity to adapt to climate change. For example, our Adaptation Cost Curve helps us to prioritise adaptation actions that provide most financial benefit. Such decision-support tools will continue to be incorporated into core sustainability and resilience activities.

Our current Council Plan outlines our intention to be an accessible, transparent, and responsive organisation. This commits us to strong community engagement, and requires us to continue to monitor our risks, demonstrate progress, and share lessons learnt.

Failure to understand and respond to the impact of changing climate and extreme weather events is listed as a key risk on our risk management register, we are required to regularly report and review the controls we have in place to mitigate the impacts associated with climate change.

It is important that we develop a strong monitoring and evaluation framework to track our progress, and review the relevance of our actions as new information becomes available.

Actions: What we will do to continue to build Melbourne's climate change adaptation capabilities and expertise

	Action	Delivery Mechanism	Timeframe	Business Impact
5.1	Work with industry specific working groups and networks to drive innovation and research in climate change adaptation.	Partner	Ongoing	Subject to annual plan and budget
5.2	Complete an interdependency study mapping the city's infrastructure and service systems relationships and stakeholder networks to enable integrated adaptation across services.	Deliver	2017-18	Business as usual budgets
5.3	Continue to develop tools and training to help City of Melbourne staff to: <ul style="list-style-type: none"> Increase staff understanding and knowledge of impacts of climate change on our assets, services and customers. Integrate climate change adaptation into processes, policies and governance arrangements (including procurement). 	Deliver	Ongoing	Business as usual budgets
5.4	Advocate to the Victorian Government to clarify roles and responsibilities of state and local governments for climate change adaptation.	Advocate to the Victorian Government	2017-18	Business as usual budgets
5.5	Develop a monitoring and evaluation framework including the development of defined targets to track and report on progress and relevance of the refreshed strategy.	Deliver	Ongoing	Business as usual budgets



5. DEVELOPING NEW WAYS TO MEASURE OUR PROGRESS

A robust, ongoing monitoring and evaluation program will be fundamental to understanding the success of our implementation activities, helping to inform targets and guide future decisions.

To assess the effectiveness of our interventions, we will establish an ongoing monitoring program to track changes over time. Such a program will require the preparation of a monitoring and evaluation framework, identification of monitoring and evaluation partners and responsibilities, establishment of a documentation and reporting protocol and evaluation of the results captured.

An implementation plan will be developed to detail a range of key performance indicators for each action outlined in the strategy refresh. These indicators will be integrated into the monitoring and evaluation framework to provide for continuous learning opportunities and enable us to showcase our successes. We will also augment existing targets such as in the Urban Forest Strategy and Total Water Mark: City as a Catchment with new precinct based targets for permeability and green infrastructure.

APPENDIX 1: CLIMATE CHANGE ADAPTATION ACTION GAP ANALYSIS

KEY CHALLENGES	EXISTING WORK THAT ADDRESSES THE KEY CHALLENGES	WHAT ARE THE GAPS OR AREAS THAT WE NEED TO STRENGTHEN?	HOW DO WE FILL THE GAPS?
Inundation from floods and sea level rise	<ul style="list-style-type: none"> Stormwater capture and reuse at Birrarung Marr; Queen Victoria and Alexandra Gardens, Fitzroy Gardens and Carlton Squares Implementing integrated water management at Southbank (Southbank Stormwater Infrastructure investigation) Finalisation and ongoing improvement of the Integrated Climate Adaptation Model (ICAM) Implementing planning regulations to increase use of domestic rainwater storage Reviewed cleaning regime for drains to operate effectively during flood events and drainage upgrades Created checklist/handout for developers outlining options to increase resilience of new developments Creation of Planning Policy 22.23 Stormwater management (Water Sensitive Urban Design) and Policy 22.19 Energy, water and waste efficiency Assisting building owners to implement water targets through the 1200 Buildings program Assisting building owners to implement rain water tanks Incorporating adaptation considerations into Queen Victoria Market renewal Promotion of infrastructure adaptation actions, e.g. ArtPlay cool roof of Implementation of the Elizabeth Street Catchment Integrated Water Cycle Management Plan University Square Master Plan project delivery Finalisation of Nature in the City Strategy Research into and trials of tree species that will be appropriate for future climate Investigating hydrazones in parks to improve irrigation efficiency Development of an Integrated Water Management Plan for the municipality which will lead to place-based approaches (in progress) Delivery of Moonee Ponds Creek Master Plan and Integrated Water Management Plan for the Moonee Ponds Creek catchment Collaboration with the Victorian Government and agencies to ensure adaptation considerations are included into urban renewal areas such as Fishermans Bend and Arden Macaulay Strengthening our relationship with Melbourne Water to maintain knowledge about waterways quality Trial and assessment of pervious pavements Involvement with Cooperative Research Centre: Water Sensitive Cities Implementing the Sea Level Rise Adaptation Action Plan, which outlines cost effective adaptation measures developed by the Association of Bayside Municipalities 	<ul style="list-style-type: none"> Permeability of the catchment and municipality - increasing the extent of porous surfaces to reduce rainfall run-off where it has been identified as appropriate to do so Urban design policy incorporating adaptation considerations (needs strengthening) Urban renewal areas planning for flooding and sea level inundation risk (this work needs strengthening) Update Water Sensitive Urban Design (WSUD) guidelines Incorporate adaptation considerations into structure plans and associated planning scheme amendments where possible (this work needs strengthening) Undertake flood modelling across the municipality (in progress) 	<ul style="list-style-type: none"> Increase permeability across the municipality by introducing place-based permeability targets building on those already in the Elizabeth Street Catchment Plan (green infrastructure, permeable pavements etc.) Work with key partners to develop climate change adaptation plans for urban renewal precincts Investigate innovative integrated water management solutions to improve flood mitigation urban renewal areas

KEY CHALLENGES	EXISTING WORK THAT ADDRESSES THE KEY CHALLENGES	WHAT ARE THE GAPS OR AREAS THAT WE NEED TO STRENGTHEN?	HOW DO WE FILL THE GAPS?
Increase greening in the city, including green roofs, walls, facades, open space and urban forest in the public and private realm	<ul style="list-style-type: none"> Growing Green Guide delivery Urban Forest Strategy: <ul style="list-style-type: none"> - Urban Forest precinct planning - Tree replacement program - Boulevard master plans Advocating for overall urban design for places to ensure that spaces and streets are best designed for our urban forest and for people Open Space Strategy delivery Undertaking municipality rooftop adaptation segmentation study for green roofs and walls Greening Our Laneways pilot delivery Delivering Economic Framework for Green Infrastructure Incorporating water management in parks contract Researching methods to enhance soil moisture Managing vegetation health for heat stress University Square project delivery (public open space) Carlton squares stormwater harvesting project delivery Delivery of park expansions at Pelham Street, Lincoln Square and Argyle Square Nature in the City – Urban Ecology and Biodiversity Strategy delivery Transforming Southbank Boulevard as part of the implementation of the Open Space Strategy and Urban Forest Strategy Promoting retention of open space on private land, especially in areas and in configurations that allow for the planting of canopy trees Development of a plan to utilise harvested storm water for the irrigation of Melbourne's parks and gardens 	<ul style="list-style-type: none"> Greening the private realm Knowledge on the benefits that environmental services provide Climate adapted parks and vegetation <ul style="list-style-type: none"> - planting species for future climate (in progress but needs strengthening) Urban design policy incorporating adaptation considerations (needs strengthening) Protecting the public realm – ensuring trees and vegetation have enough sun and water; public spaces are protected from wind and heat 	<ul style="list-style-type: none"> Implementing the Urban Forest Fund Using latest research and best practice when adapting our parks and trees Research to further understand the environmental services that trees, green infrastructure, parks, and nature as a whole bring to the city

APPENDIX 1: CLIMATE CHANGE ADAPTATION ACTION GAP ANALYSIS

KEY CHALLENGES	EXISTING WORK THAT ADDRESSES THE KEY CHALLENGES	WHAT ARE THE GAPS OR AREAS THAT WE NEED TO STRENGTHEN?	HOW DO WE FILL THE GAPS?
Emergency response to heat and storms	<ul style="list-style-type: none"> Reviewing and communicating the City of Melbourne Heatwave Response Plan Delivery of communication plans for information sharing during emergency event, for example heat health alerts Providing information to the public during extreme events through information resources such as cool places map, drinking fountain maps, relief centre map Collaborating with external agencies to prioritise and coordinate response clean-up plans for emergency events Delivery of Refuge at Arts House Heatwave and Homelessness Action Plan delivery Revision of the event protocols to enable safe, successful events in extreme weather conditions including: <ul style="list-style-type: none"> Improved communications with event attendees and organisers regarding precautions Water provision on hot days Event restriction during adverse weather conditions when required and Collaboration with event operators to promote responsible alcohol consumption, on hot days, where appropriate. Providing access to safe shelters in the event of mass stranding (ideally located at or near major transport hubs) Reviewing the Community Emergency Risk Assessment within Municipal Emergency Management (MEM) Plan to ensure that climate change is considered Reviewing Safe City Cameras to monitor and understand whether there is an increase in anti-social behaviour during heatwaves Reviewing all sub plans of MEM Plan to ensure they consider climate change Collaborating with the Municipal Association of Victoria to advocate on behalf of councils to inform new emergency legislation that defines council roles and responsibilities Redesigning the public realm for thermal comfort in hotter conditions: implement shading, cool places and public water facilities (needs strengthening) 	<ul style="list-style-type: none"> Secure energy generation and resilient energy network Extreme weather plans for vulnerable communities and planning for extreme cold weather Urban design policy incorporating adaptation considerations Need for increased cool spaces/ refuges during times of heat Increase social inclusion to build resilience of community to extreme events Need to deal with social responsibility when entering into contracts with others to ensure the community benefits Redesign the public realm for thermal comfort in hotter conditions: implement shading, cool places and public water facilities (needs strengthening) Improvement of building standards Plan for the implementation of adaptation options in existing City of Melbourne buildings Trial adaptation options in existing City of Melbourne buildings Update design guidelines for new City of Melbourne buildings with current knowledge and best practice for adaptation Update capital works guidelines (and decision making process), with current knowledge and best practice for adaptation 	<ul style="list-style-type: none"> Partner with key stakeholders to identify and develop opportunities for increasing energy security and resilience to electricity failures. Develop additional techniques for cooling public spaces and communicate to workers, residents, and visitors the location of these cool places using innovative techniques Continue to develop innovative and sector leading extreme weather plans to ensure appropriate and inclusive support is provided to vulnerable communities

KEY CHALLENGES	EXISTING WORK THAT ADDRESSES THE KEY CHALLENGES	WHAT ARE THE GAPS OR AREAS THAT WE NEED TO STRENGTHEN?	HOW DO WE FILL THE GAPS?
Insurance and resilience of small business	<ul style="list-style-type: none"> Delivery of Inner Melbourne Climate Change Adaptation Event on Insurance and Climate Change Adaptation 	<ul style="list-style-type: none"> Improving the resilience of small businesses Understanding insurance and climate change and educating the community and business on climate risk Legal liability and climate change – investigate and communicate legal liability risks effectively to relevant internal and external stakeholders 	<ul style="list-style-type: none"> Develop education materials and engage with businesses regarding planning for extreme weather events Partner with the insurance industry, Resilient Melbourne Office and the Victorian Government to explore options for finance mechanisms that strengthen the business case to leverage funds for adaptation and maximise climate risk management and adaptation Victorian Government will host a forum on legal liability and land-use planning decisions
Embedding climate change adaptation in the work that we do	<ul style="list-style-type: none"> Undertaking the Climate Change Adaptation Strategy 2009 comprehensive risk assessment for Melbourne Participating in the Inner Melbourne Climate Adaptation Network (IMCAN) – a multi-agency information sharing network Creating a stronger adaptation focus in Sustainability Basics training for City of Melbourne staff Asset Management Strategy 2015-2025 delivery Reviewing (periodically) that Council has appropriate insurance cover to protect assets and infrastructure from climate related events Participating in networks such as C40 Connecting Delta Cities Creating an Internal Climate Change Adaptation Working Group Strengthening relationships with adjoining municipalities to consider linkages in heatwave response plans by sharing resources and attending North West Metro Region Collaboration Group, IMCAN and Department of Health and Human Services heatwave planning sessions Maintaining relationships with Department of Environment, Land, Water and Planning, Chief Resilient Officer and Emergency Services Victoria Promoting infrastructure adaptation actions, e.g. ArtPlay cool roof Monitoring performance of ArtPlay cool roof Trialling non-grid or low power grid options (includes solar light trial) Working with 100 Resilient Cities and Resilient Melbourne Office 	<ul style="list-style-type: none"> Understanding the effectiveness of our adaptation actions Data on the impacts of climate change Clarification on roles and responsibilities of local government Deliver targeted sustainability and adaptation training for City of Melbourne staff Embed adaptation specifications into procurement process Monitoring and evaluating our adaptation actions and progress 	<ul style="list-style-type: none"> Real time data capture to provide benchmarks and inform decision making Monitoring and evaluation framework for adaptation Partner with the Victorian Government to clarify roles and responsibilities for climate change adaptation. Developing a Monitoring and Evaluation Framework with Key Performance Indicators for actions

References

- Victorian Government Department of Human Services 2009, January 2009 Heatwave in Victoria: an Assessment of Health Impacts
- Hutley, N and Hartford-Davis, S 2016, Climate Change and Directors' Duties, The Centre of Policy Development and The Future Business Council
- Angry Summer 2016/17: Climate Change Super-charging Extreme Weather by Professor Will Steffen, Andrew Stock, Dr David Alexander and Dr Martin Rice
- City of Rotterdam 2013, Climate Change Adaptation Strategy
- City of New York 2013, A Stronger, More Resilient New York
- City of Copenhagen 2012, Cloudburst Management Plan 2012
- Victorian Government Department of Environment, Land, Water and Planning 2017, Victoria's Climate Change Adaptation Plan 2017-2020



How to contact us

Online:

melbourne.vic.gov.au

In person:

Melbourne Town Hall - Administration Building
120 Swanston Street, Melbourne
7.30am to 5pm, Monday to Friday
(Public holidays excluded)

Telephone:

03 9658 9658

7.30am to 6pm, Monday to Friday
(Public holidays excluded)

Fax:

03 9654 4854

In writing:

City of Melbourne
GPO Box 1603
Melbourne VIC 3001
Australia

**Interpreter services**

We cater for people of all backgrounds
Please call 03 9280 0726

03 9280 0716	ខ្សោយចាត់
03 9280 0717	廣東話
03 9280 0718	Ελληνικά
03 9280 0719	Bahasa Indonesia
03 9280 0720	Italiano
03 9280 0721	國語
03 9280 0722	Soomaali
03 9280 0723	Español
03 9280 0724	Türkçe
03 9280 0725	Việt Ngữ
03 9280 0726	All other languages

National Relay Service:

If you are deaf, hearing impaired or speech-impaired,
call us via the National Relay Service: Teletypewriter (TTY)
users phone 1300 555 727 then ask for 03 9658 9658
9am to 5pm, Monday to Friday (Public holidays excluded)