Greater Sydney Heat Smart City Plan

2025–2030







The Greater Sydney Heat Taskforce acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the lands and waters of this place we now call Metropolitan Sydney. We pay our respect to Elders past and present of the Eora, Dharawal (Tharawal), Gundungurra, Dharug (Darug) and Guringai (Kuring-gai) peoples.

The development of the Heat Smart City Plan was facilitated by WSROC and Resilient Sydney and funded through the Disaster Risk Reduction Fund. The Disaster Risk Reduction Fund (DRRF) is jointly funded by the Australian and New South Wales governments.

Australian Government

NSW GOVERNMENT

The Heat Smart City Plan was developed through engagement with the Greater Sydney Heat Taskforce, an Expert Reference Panel and other organisations and businesses across Greater Sydney.

GREATER SYDNEY HEAT TASKFORCE

WSROC – Advocating for the people of Western Sydney

RESILIENT SYDNEY

NSW Reconstruction Authority

Australian Government – Department of Climate Change, Energy, the Environment and Water

Australian Red Cross

Blacktown City Council

BUSINESS WESTERN SYDNEY

Committee for Sydney

Endeavour Energy

Green Building Council Australia

LIVERPOOL CITY COUNCIL

NSW Police Force

PROPERTY COUNCIL of Australia

SWELTERING CITIES .org

Swiss Re

Sydney WATER

western sydney community forum

EXPERT REFERENCE PANEL

THE UNIVERSITY OF SYDNEY

UNSW SYDNEY

WESTERN SYDNEY UNIVERSITY

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Other projects implemented under the Greater Sydney Heat Taskforce program and referenced in the Plan include:

- **Cool Suburbs** - delivered by Edge Impact and Netgain Advisory
- **Heatwave Risk Methodology** - delivered by Water Technology
- **Heatwave Management Guide** - delivered by Civille

Community enjoying open space near water.

FOREWORD

As Chair of the Greater Sydney Heat Taskforce, I am honoured to present the Heat Smart City Plan (HSCP), a comprehensive blueprint designed to safeguard our communities, economy, and environment from the escalating impacts of heat. In Australia, heat is our most deadly natural hazard. Yet, despite these significant and growing impacts, Greater Sydney has lacked the coordinated arrangements necessary to effectively measure, mitigate, and manage the consequences of rising temperatures. This plan seeks to address that critical gap.

Over the past 18 months, the Taskforce has collaborated with experts across multiple sectors to develop a strategic response that not only addresses the immediate challenges posed by heat but also lays the groundwork for long-term resilience. The Heat Smart City Plan is the culmination of this collaborative effort. It embodies our vision of a future where the people of Greater Sydney can survive and thrive in a warming climate and during extreme heat events.

I would like to extend my deepest gratitude to all the stakeholders, partners, and experts who have contributed to this effort. Your dedication and insight have been invaluable in shaping a plan that is both visionary and practical. As we move forward, it is crucial that we continue to work together, building on this foundation to create a Greater Sydney that is resilient, sustainable, and prepared for the challenges of the future.

The journey ahead will not be easy, but with the Heat Smart City Plan as our guide, I am confident that we are on the right path to a safer, cooler, and more resilient Greater Sydney.

Mr Kerry Robinson OAM

Chair, Greater Sydney Heat Taskforce
CEO of Blacktown City Council

Charles Casuscelli,
CEO
Western Sydney Regional Organisation of Councils (WSROC)

Facilitating the Greater Sydney Heat Taskforce has been an extraordinary journey for WSROC. Councils have been at the coalface of heat impacts for many years, establishing heat as a critical issue and spearheading innovative solutions. This process has taken the power of collective action to a whole new level. Working in genuine partnership with government, industry and community sectors, we have built a framework for a resilient and thriving Greater Sydney. I look forward to making Sydney the world's first heat resilient city.

Kathryn Smith,
Branch Head of the National Adaptation Policy Office
Australian Government Department of Climate Change, Energy, the Environment and Water

We all have a role to play to ensure we are better prepared to deal with and adapt to climate change. Australia is projected to experience more extreme heat waves, with risks to mortality, and consequences for systems such as energy networks. With coordinated, effective local actions, communities will be better protected from the extreme heat we cannot avoid. The Heat Smart City Plan is an exemplar of locally led, coordinated action which complements the National Climate and Health Strategy, and the forthcoming National Adaptation Plan.

Monica Barone,
Chair
Resilient Sydney

Resilient Sydney analysis confirmed extreme heat as the greatest life safety risk for Greater Sydney. This city-wide plan is the transformative roadmap we needed so we can work together beyond our boundaries to take effective action as partners to significantly reduce that risk.

Amanda Leck,
Head of Adaptation, Mitigation and Reconstruction
Reconstruction Authority

The NSW Reconstruction Authority (RA) identified heatwave as a priority hazard in the NSW State Disaster Mitigation Plan (SDMP) which was released in early 2024 and we are pleased to have been part of the conversation in developing the Heat Smart City Plan. The RA will have an important role in realising the ambition set out in the plan through our adaptation, mitigation, and preparedness work in NSW.

Emma Bacon,
Executive Director
Sweltering Cities

As an organisation that works directly with communities in Western Sydney's hot suburbs, we have a deep understanding of the complex ways that people are affected by rising temperatures. Participating in the Heat Taskforce has enabled us to put community at the heart of heat resilience and adaptation planning. The Heat Smart City Plan is unique in Australia in how it tackles the city wide and systemic issues, whilst maintaining a deep local understanding of the city. Sweltering Cities looks forward to supporting the implementation of this essential plan.

David Borger,
Executive Director
Business Western Sydney

Addressing urban heat is critical for Western Sydney, where rising temperatures directly impact the health, wellbeing, and productivity of our communities. Coordinated action through the Greater Sydney Heat Taskforce is essential to protect residents and businesses alike, ensuring our cities and suburbs are resilient in the face of the changing climate. The Taskforce's focus on integrated, practical solutions supports Business Western Sydney's mission to advocate for sustainable, liveable urban environments that foster economic growth and opportunity for all.

Jamie Caldwell,
Energy & Utility Services Functional Area Coordinator (EUSFAC)
Energy & Utility Services Functional Area (EUSFA)
Director Energy Operations, Department of Climate Change, Energy, the Environment and Water

As EUSFAC & Combat Agency Controller for significant electricity and gas hazards and emergencies in NSW, I recognise heat as a priority hazard with major impacts to the energy and utility sectors and significant consequences to the community. The Greater Sydney Heat Taskforce has spotlighted heat as a priority hazard and championed ideas for whole of government and community solutions. I look forward to being involved in further work relating to positive community outcomes of public safety and resilience.

Guy Chalkley,
Chief Executive Officer
Endeavour Energy

Endeavour Energy has been powering Western Sydney since 1890. Our role is to supply safe, reliable, resilient and affordable power to over 2.7 million people in Sydney's fastest growing regions. Increasingly, we are experiencing the impact of climate change on our critical infrastructure and can attest to how this increases the vulnerability of people, assets and socio-economic activities across our network. We commend the City Plan for addressing this critical issue and look forward to continued collaboration as we support its delivery.

Jorge Chapa,
Chief Impact Officer
Green Building Council of Australia

The Heat Smart City plan should be the industry's go-to guide for understanding and managing heat risks. By addressing these risks now, we can ensure long-term benefits for our cities while also reducing carbon emissions.

Roch Cheroux,
Managing Director
Sydney Water

The Greater Sydney Heat Taskforce is critical in managing the current and projected heat impacts across Greater Sydney. The important role that water plays in mitigating urban heat is well-defined within the Heat Smart City Plan and aligns with Sydney Water's strategic objectives and reflects several priorities within the Greater Sydney Water Strategy. We look forward to continuing this important work with the Taskforce and helping to guide the actions within the Heat Smart City Plan for the benefit of our communities.

Cherie Gray,
Global Lead Sustainability & Market Development, Public Sector Solutions
Swiss Re

As a global reinsurer, Swiss Re has seen the significant increase of climate related weather events, and extreme heat may have the greatest potential to threaten human health, physical infrastructure and economic activity. Closing the protection gap will depend on extending protection to all levels of society that currently lack cover. To improve availability and access we must enhance our understanding of how factors like rising temperatures will change the risk landscape and update our practices accordingly.

Dr Patrick Harris
UNSW International Centre for Future Health Systems

The climate emergency demands a response that is interdisciplinary and action focussed, and engages policy systems and policy makers with researchers and civil society organisations to develop evidence based solutions to improve health, wellbeing and equity. The commitment of the Greater Sydney Heat taskforce to develop this response has been world class. That work and the report should provide the roadmap for action for many years to come.

Ismail Ibrahim,
Acting Director – New South Wales and National Migration Strategy
Australian Red Cross

Heatwaves are becoming more intense and frequent in Sydney, placing significant strain on the wellbeing of individuals and communities. The creation of The Heat Smart City Plan and the collaborative efforts of the Greater Sydney Heat Taskforce have resulted in a unified call to action to address the unique needs of at-risk populations to increase resilience to heatwaves. The Heat Smart City Plan leverages diverse experiences, providing a strong example of how cross-sector collaboration can result in better resilience outcomes for communities.

Sam Kernaghan,
Director, Resilience Program
Committee for Sydney

Everyday we are making macro and micro decisions that intensify the impact of heat on households and businesses across metropolitan Sydney. We commend WSROC for confronting the scale and complexity of this urgent challenge, and laying down a range of practical solutions. The Committee for Sydney is dedicated to creating a more equitable and resilient Sydney, reducing the economic impacts on and communities, and enabling the implementation of this ambitious plan.

Dr Ollie Jay,
Professor of Heat and Health and Director of the Heat and Health Research Centre
The University of Sydney

The Heat and Health Research Centre at the University of Sydney is a multidisciplinary collaboration focused on identifying the most effective ways to mitigate the health impacts of extreme heat across the human lifespan. The Heat Smart City Plan offers a critical framework for translating the best available evidence into actionable strategies that will build meaningful resilience in Sydney's most heat-vulnerable communities. Moving forward, we are committed to partnering with all stakeholders to implement this plan, ensuring that the people of Sydney not only survive but thrive in a warmer future.

Greg Moore,
Commander of the NSWPF Incident and Emergency Management Command
NSW Police

The NSW Police Force is committed to safeguarding our community during significant heat events. The Heat Smart City Plan supports existing protocols around public safety and resilience. Our collaboration in this initiative underscores our dedication to protecting lives and maintaining order during extreme weather conditions.

Professor Nicky Morrison,
Co-Director Urban Transformations Research Centre
Western Sydney University

The Urban Transformations Research Centre at Western Sydney University is dedicated to creating sustainable, equitable, and resilient communities. By generating essential knowledge, we support the Taskforce in developing evidence-based policies, strategies, and solutions that underpin the Heat Smart City Plan. We are committed to working collaboratively with all stakeholders to ensure the plan's recommendations are implemented across Greater Sydney and beyond.

Billie Sankovic,
Chief Executive Officer
Western Sydney Community Forum

Western Sydney is a region particularly susceptible to the impacts of heat, with local climate conditions and rapid urbanisation exacerbating existing vulnerabilities. The Heat Smart City Plan is a welcome response to the challenges our communities will face in coming decades as we confront rising climate temperatures and more frequent extreme heat events.

Professor Sebastian Pfautsch PhD GAICD,
Urban Management and Planning
Western Sydney University

Western Sydney University has a dedicated, multidisciplinary urban heat research program. We take heat safety of our students, staff, assets and wider community seriously and deliver greening and cooling programs across our campuses and the Greater Sydney region. We will use the Heat Smart City Plan to expand our leadership in urban cooling. The Plan signifies the culmination of many years of successful collaboration between WSU and WSROC.

Prof Mat Santamouris,
Anita Lawrence Chair High Performance Architecture, School Built Environment
University New South Wales

The High Performance Architecture Research Unit of the School of Architecture Design and Arts of UNSW, is developing and Implementing advanced Heat Mitigation Technologies to counterbalance the impact of urban overheating. The Heat Smart City Plan is a wonderful project aiming to face overheating and improve the quality of life in Sydney. In UNSW we are strongly committed to contribute towards the implementation of the plan and prepare a bright future for Sydney.

Prof David Schlosberg,
Director of the Sydney Environment Institute and Professor of Environmental Politics
The University of Sydney

The Sydney Environment Institute brings together a broad range of researchers focused on the impacts of climate-induced disasters, with a particular interest in community-engaged and just adaptation pathways. This Heat Smart City Plan combines an incredibly comprehensive study of the issues facing greater Sydney and a broad-ranging, impactful set of proposed interventions. We look forward to assisting with the implementation of the recommendations, and continuing to provide the research and evidence base to address the threat of heatwaves, especially for those most vulnerable to their impacts.

Katie Stevenson,
NSW Executive Director
Property Council of Australia

If we want cooler, more liveable suburbs, and more valuable properties, we need to tackle urban heat, and it needs to be a shared effort. Only by working together will we find the right solutions to mitigate the impacts. The Heat Smart City Plan and the Heat Taskforce demonstrate the kind of collaborative effort that will promote more sustainable development, improve the resilience of our infrastructure and foster healthier communities. That's good for the property sector, and good for everyone.

Doctor with patient.

CONTENTS

Photo credits: WSROC

Woman closing curtains to keep home cool.

EXECUTIVE SUMMARY

This Heat Smart City Plan has been prepared through a collaborative process involving organisations across health, planning and design, infrastructure, emergency management and community and corporate sectors.

This Plan outlines the:

- **broad spectrum of heat risk to Greater Sydney**
- **need for a coordinated approach to managing heat risk**
- **actions needed to effect change by 2030**

The purpose of the Heat Smart City Plan is to outline key directions for change as agreed in consultation with our stakeholders.

The next step will be to develop a Heat Smart Implementation Plan that will detail the funding, timing and reporting of the recommendations in this Plan.

WHY GREATER SYDNEY NEEDS A HEAT SMART CITY PLAN

Extreme heat is arguably one of the greatest threats to Sydney's health, liveability, and productivity in the immediate future and long term.[1]

Historically, heat has killed more Australians than fire, flood and storms combined.[2] It is widely agreed that health impacts of heat are vastly underestimated because they are not systemically recorded.[6]

Beyond mortality, heat has a range of complex and cascading impacts on city systems, including:

- **Infrastructure:** Reductions in energy transmission capacity, failures of signalling equipment.
- **Economy:** Lost productivity, business disruption (network connectivity, e-payment) and stock losses (agriculture, cold storage, transport, and logistics).
- **Community:** Increased energy and medical bills, lost work, social and mental health impacts, exacerbation of medical conditions.
- **Environment:** Tree canopy die-back, heat-related deaths of native fauna, as well as water and air quality impacts.[3]

Communities around Australia are increasingly exposed to more frequent and intense heat events under a changing climate.[4] While temperatures in Greater Sydney are not as extreme as elsewhere in NSW, the sheer scale of population, assets and systems simultaneously exposed to heat hazard creates significant risks for community, social and economic health.

In the event of an unprecedented heatwave, there is a risk that Sydney's response capacity would be overwhelmed due to systemic breakdowns of enabling infrastructure, loss of air-conditioning, lighting, lifts, train and traffic signalling, water supply, medical equipment, and telecommunications.

In addition to extreme events, the ongoing pressure of higher average temperatures and urban heat islands are creating chronic stressors for the city and its communities, exacerbating issues like cost-of-living and quality of life.

Greater Sydney does not currently have coordinated arrangements to address the full spectrum of heat risk it is exposed to. In the absence of such arrangements, there is a need for key actors to come together and agree on a path forward.[5]

This has been the purpose of the Greater Sydney Heat Taskforce. The Heat Smart City Plan is a framework for a coordinated approach to heat risk management in Greater Sydney, supporting the city and its people to:

- Make informed decisions related to heat impacts
- Design heat resilient places for people
- Protect our economy from heat impacts
- Have heat resilient infrastructure, and
- Be heatwave ready

PURPOSE OF THE HEAT SMART CITY PLAN

This Heat Smart City Plan recommends a coordinated program of activities to manage city wide heat risk reduction (mitigation and adaptation), as well as improving heatwave management. Delivery will require a broad spectrum of actions including refining business-as-usual, new initiatives, pilot programs, and advocacy.

HOW THE PLAN WAS DEVELOPED

The Heat Smart City Plan has been prepared through a collaborative codesign process involving over 13 workshops and 34 interviews and engagement with over 370 individuals. The codesign process started by establishing an agreed shared vision and outcomes to strive for. This vision provided the framework for identifying focus areas and recommendations for implementation.

THE HEAT SMART CITY PLAN

The agreed shared vision for this Plan is to ensure people living in Greater Sydney can survive and thrive in a warming climate and during extreme heat events.

To enable the vision, this Plan outlines six key directions and nine focus areas for the next six years. These focus areas are made up of 40 recommendations for implementation. An overview of the Plan's directions, focus areas and recommendations are outlined in Figure 1.

heatSMART

decisions

Coordinated City
Enduring, collaborative approach improves heat risk decision making for Greater Sydney.

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Benchmarking Heat
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heatSMART

places for people

Heat Safe Homes and Buildings
New and existing homes, and buildings are heat responsive and can keep people safe from heat.

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Figure 1: Overview of Heat Smart City Plan recommendations.

heatSMART

economies

Heat Smart Marketplace

The private sector supports heat risk reduction, minimises the economic impacts of heat and seeks commercial opportunities in adaptation.

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Capacity built for effective heat risk planning by business and industry.

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heatSMART

infrastructure

Heat Smart Infrastructure

Interconnected, resilient infrastructure enables communities to survive and thrive.

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heatWAVE

ready

Heatwave Ready City

Clear governance arrangements, funding and guidance supports effective heatwave management.

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Communities and organisations are empowered to take action to build community resilience, reduce risks and manage emergencies.

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heatSMART

research

Heat Smart Research

Researchers and practitioners work collaboratively to deliver heat resilient solutions.

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READING THIS PLAN

The Heat Smart City Plan is organised into four broad sections:

Section 1: Why Sydney needs this Heat Smart City Plan

The first part of this Plan seeks to build awareness of the complex, cascading and compounding ways that heat impacts our city and explains the need for a coordinated approach to managing heat risk. This rationale has been developed in collaboration with Taskforce stakeholders with the intent of providing a holistic picture of the current state of play in our city.

Section 2: How this plan was developed

This section briefly outlines the co-design process that was used to develop the Plan, and lists the different stakeholders that were involved.

Section 3: The Heat Smart City Plan

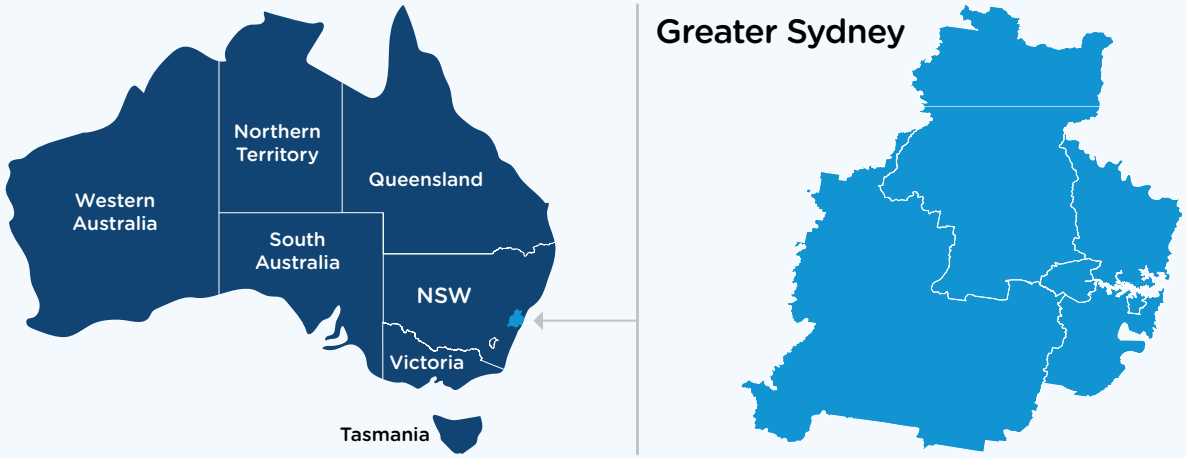
This section is the Plan proper. It provides detail on the Plan's recommendations including current status, policy context, key stakeholders, and considerations made by Taskforce stakeholders when exploring the nature of the heat challenge.

Section 4: Implementation and Governance

The last part of the Plan outlines a framework for how the Taskforce will move towards implementation of the recommendations in this Plan. This is a live discussion that we are about to embark on together as a city. We welcome and encourage you to be part of this journey. If you are committed to building our city's resilience, please get in touch.

Greater Sydney Region

The Heat Smart City Plan covers the Greater Sydney Region.
However, the Plan will have relevance to other areas within NSW and beyond.



The Greater Sydney[6] region extends across 12,372km^2, and covers some of the most intensely urbanised localities in NSW, through to vast World Heritage protected wilderness areas, and expansive coastal waterways.

The region is highly diverse, and home to 5.5 million people, or 20% of Australia's total population[6]

Sydney is recognised as an area of national importance and has one of the fastest growing populations in Australia[7]. As such it faces the distinctive sustainability challenges associated with a rapidly developing, culturally diverse, peri-urban region.

Houses perched on edge of coastal sea cliff.
West toward Sydney city on the horizon.

Woman exercising in the heat.

SECTION 1:

Why Sydney needs this Heat Smart City Plan

WHY SYDNEY NEEDS THIS HEAT SMART CITY PLAN

HEAT IS A SIGNIFICANT RISK

Heat is a significant and growing risk for cities around the world, and Sydney is no exception. Extreme heat is Australia's deadliest weather-related hazard, killing more people than fire, floods and storms combined[2]. Between 2012 – 2022 extreme heat was responsible for 70 – 84% of weather-related hospitalisations[8], and these figures are expected to increase with climate change. Beyond human health, heat has a range of complex and cascading impacts on urban and environmental systems[3] including:

Infrastructure: Reductions in energy transmission capacity, failures of signalling equipment.

Economy: Lost productivity, business disruption (network connectivity, e-payment) and stock losses (agriculture, cold storage, transport, and logistics).

Community: Increased energy and medical bills, lost work, social and mental health impacts, exacerbation of medical conditions.

Environment: Canopy die-back, heat-related deaths of native fauna, water and air quality losses.

A range of sectors, industries and communities across Greater Sydney are working to tackle the impacts of heat. However, heat remains an emerging policy issue with few formal governance structures[5]. Because of this, the way heat is defined, measured and managed varies significantly across the city, creating challenges for cross-sectoral collaboration. This Plan seeks to outline a holistic approach to understanding heat risk and impacts in a way that supports whole-of-city action.

People, assets and systems are exposed

Greater Sydney's 5.5 million residents are exposed to heat every summer, and this exposure is increasing as our population grows, and climate change drives more frequent and severe heat events. While temperatures in Greater Sydney are not as extreme as elsewhere in NSW, the sheer scale of population, assets and systems simultaneously exposed to heat creates significant risks for community, social, environmental and economic health.

Sydney relies on a complex network of urban systems to function and many of these are sensitive to heat exposure. Importantly, exposure of different city elements are interrelated. For example, people depend on environmental systems like trees and water for cooling, and human exposure increases pressures on infrastructure. This Plan seeks to understand how these exposed elements can work together to build resilience.

Listening to communities

"I need to prioritise paying my electricity bill over buying food and other necessities."

– Quote from a resident of Penrith[9]

Person modifying thermostat for household air-conditioner.

Heat Impacts:

Half of Sydney's
urban **tree species**
vulnerable to extreme heat[10]

Mass deaths
of flying foxes and birds at temperatures over **42°C**[11]

Cost of living:
energy use **triples** on days **35°C** and hotter[3]

50%
rise in **domestic violence**
when temperatures rise from 20°C to 40°C[12]

13%
increase in mortality[13]

$6.8 billion
annual costs (health, productivity, energy) in Western Sydney **by 2070**[14]

Unmeasured:
Business disruption
(network connectivity, e-payment, transport and logistics)[3]

Figure 2: Heat has significant impacts on people, infrastructure, the economy and environment.

What do we mean by heat?

Bringing together the different ways in which heat is understood in Greater Sydney, this Plan understands heat hazard having three key components:

Climate: Climate refers to the baseline conditions in a particular location, and how these are changing over time. Greater Sydney can be described as having a warm temperate climate with mild winters and hot summers[15]. However Greater Sydney is also a large geographic area with significant climatic variations within its boundaries. The western extremes of Sydney can be several degrees hotter than the city's coastal areas due to the presence of cooling sea breezes[3].

Urban heat: Urban heat refers specifically to how urban development and human activities – concrete, buildings, bitumen and parks – make the baseline climate warmer or cooler[3]. This driver is the key focus of urban planners and designers.

Heatwave and extreme heat: Finally, heatwaves and extreme heat refers to short term weather events that occur in a location at a particular point in time[16]. Weather events add to baseline climate and urban heat conditions. Heatwaves cannot be prevented, but their severity can be mitigated, and we can respond with measures to improve the resilience of communities, assets and the environment.

While each of these drivers are interrelated, they require different treatment strategies and are owned by different sectors operating in our city. In order for this Plan to holistically address heat hazard, all three elements are discussed and explored.

SYDNEY IS IMPACTED NOW

While more work is needed to understand the full scale of impacts, an overview of current research is outlined below.

13% increase in mortality

Research examined data on mortality, emergency department (ED) visits and ambulance calls in the Sydney region during an exceptional heatwave on 30 January – 6 February, 2011. They found that all-cause ED visits increased by 2%, all-cause ambulance calls increased by 14%, and all-cause mortality increased by 13% compared to the reference period[13].

Heat-associated deaths are generally not well documented, in large part because such deaths outside of recognised extreme heat events tend to be overlooked. And, even during a recognized event, heat can often contribute to cause of death without being the direct or main cause. Heat-related fatalities most often refer to the exacerbation of pre-existing medical conditions such as heart disease or stroke. Such deaths are generally recorded officially under that medical condition, resulting in an underestimation of heat-associated mortality.[2]

Billions in lost productivity

For Australia as a whole, it has been estimated that heat stress at work causes absenteeism and reduced productivity amounting to a lost value of US$6.2 billion per annum[17].

Recently, it has been estimated that the total costs from heatwaves in Western Sydney are $1.4 billion per year today, and growing[14]. In these estimates, lost workplace productivity made up approximately $0.4 billion of this total, with the other main components being health and cooling costs. By 2060-61, it is estimated between 700K – 2.7M working days will be lost due to an increase in the frequency of heatwaves[48].

Serious mental health impacts

Heat is associated with increased aggression, domestic violence, mental and behavioural disorders including self-harm, mental health emergency presentations and hospital admissions[10]. The mental health impacts of extreme heat have been described as equivalent to those of unemployment[18].

Locally, monitoring of mental health presentations to the Westmead Hospital emergency department found that for women, the risk of presentation increased steadily for temperatures between 28°C and 38°C[19].

Women walking outside Liverpool hospital.

Increasing social isolation

Many Sydney-based studies have shown strong connections between heatwaves and social isolation as people retreat indoors to shelter from extreme conditions. In a study following the record 2016-17 summer, Penrith residents reported a wide range of physical and mental health challenges were exacerbated by social isolation due to disrupted transport, reduced social activities, and service access[20].

Increased risk of power outages

Peak electricity demand increases by almost 100% when temperatures rise from 20 to 40°C[21]. At the same time, heatwaves put physical stress on energy infrastructure, making power outages more likely. This in turn affects energy-dependent urban systems such as trains and traffic lights.

There are many examples of blackouts in parts of Sydney during extreme heat, and Sydney residents are often urged to curb their power use during heatwaves to help the system cope.

Risk of infrastructure damage and failure

Heat not only leads to spikes in peak electricity demand, it can also impair the operation of key electricity infrastructure like generators, transformers and transmission lines. This can lead to power outages, which can have cascading impacts on other infrastructure and services in other sectors[22].

Heat places stress on the city's water system. Sydney Water registers peaks in demand for water supply on hotter days as a result of community response to conditions. There is increased use of drinking water across the public and private domain, for irrigation, swimming pools, water play areas, fountains, green spaces and cooling towers. With increasing and more frequent hot days and a growing population, it is expected that pressures on the water treatment and supply network will grow. In addition, compounding hazards such as drought will exacerbate the issue, water supplies may be limited at the same time that demands are at their highest.

Major impacts on flora and fauna

Heat puts flora and fauna under stress and these impacts are magnified in drought conditions. Heatwaves can lead to mass deaths of sensitive species such as flying foxes and birds[24]. A review of flying fox deaths over the 2019-20 summer found mass die-offs from extreme heat events were observed in 30 flying fox camps in NSW, including 12 in the Sydney region[4].

Trees and vegetation, an important solution to rising heat, are also vulnerable. A study tracking 23 common urban tree and shrub species in Sydney during the 2019-20 summer found more than half (13 species, including natives) were vulnerable to hot, dry conditions, showing evidence of notable die back[10].

Listening to communities

"We do not leave the house (during heatwaves), I sometimes have to cancel work to stay with him."

– Quote taken from a community member who cares for her husband due to illness in Penrith[9]

Woman using handheld fan with glass of water.

IMPACTS ARE UNEVENLY DISTRIBUTED

Across Greater Sydney, some people are more sensitive to heat, while others have lower adaptive capacity. The very young, elderly, people living with disability and chronic illness, addiction or mental health challenges are more sensitive to heat and susceptible to heat-related illness[2]. However, hospital admissions studies across Greater Sydney show fit, healthy individuals are also succumbing to heat-related illness, potentially due to factors like behavioural choices or exposure due to outdoor work.

Whether or not an individual is sensitive to heat, those with fewer financial and social resources (e.g. renters, new migrants) may find it more difficult to adapt to hotter conditions. Heat increases household costs, including health, cooling and productivity costs[14]. Heat also leads to intangible costs associated with disruptions to work and education, increased social isolation, and poorer environmental health. These costs are unevenly distributed, potentially increasing economic inequality.

From the frontline

"Our school has more cases than normal of students getting heat stroke because students who have newly-arrived in Australia are often not aware of heatwave risks in Australia."

– Anjana, School teacher[25]

Construction workers on a hot day.

IMPACTS ARE INCREASING WITH CLIMATE CHANGE

Communities around Australia are increasingly exposed to more frequent and intense heat events under a changing climate.

Heatwaves are becoming more frequent and longer in duration

Across Greater Sydney in the future, heatwaves are expected to be more frequent and of longer duration[26]. Around 2060-79, the expected changes include:

- 3-5 additional heatwave days per year
- 2.5-3.5 additional heatwave events per year
- The longest heatwave of the year is expected to be 3-5 additional days longer.

The Committee for Sydney (2024) summarised the projected increases in simple terms:

Heatwaves will double in frequency and quadruple in duration over the next 50 years.

Heat stands out as a future climate risk

Local councils in Sydney who have completed climate change risk assessments have identified heat as, among their most extreme future risks. This is the case in coastal local government areas as well as Western Sydney.

The exposed population is growing

While temperatures in Greater Sydney are not as extreme as elsewhere in NSW, the sheer scale of population, assets and systems simultaneously exposed to heat hazard creates significant risks for community, social and economic health. Sydney's population is growing and the number of people vulnerable to heat impacts (whether due to age, health, socioeconomic disadvantage or other factors) is growing.

For example, Northern Beaches Council's Resilience Strategy (2022)[27] rates heatwave as one of only two 'extreme' risks (the other being bushfire), due to low community preparedness, high likelihood, and potential for major consequences. Penrith Council identifies extreme heat and heatwaves as an extreme risk in their Resilient Penrith Action Plan (2021)[28] based on their climate change risk assessment, and Canterbury-Bankstown Council describes extreme heat as "One of the biggest stressors for CBCity" in their Resilient CBCity Strategic Plan (2023)[29].

The Committee for Sydney estimated the economic costs to Western Sydney from rising heat and a growing population and found:

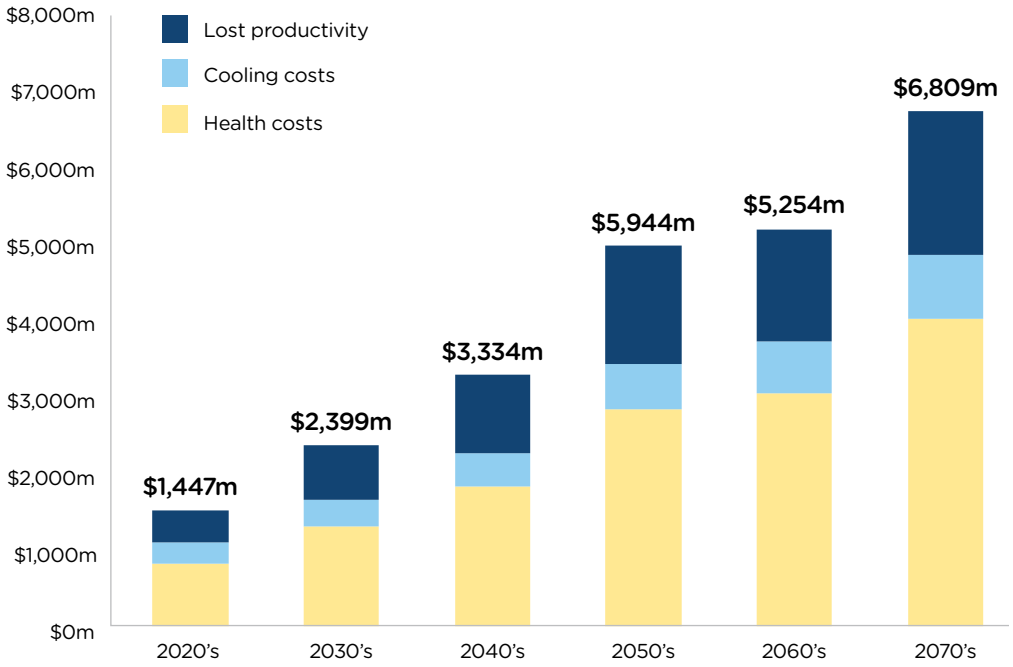
The real costs from heatwaves quadruples from $1.4billion today, to on average, more than $6.8billion by the 2070s.[14]

Listening to communities

"I was surprised to get a message from the after-school care providers advising parents to collect their children from the service as soon as possible, as their facilities have no air-conditioning, and it was too hot to go outside and too hot to stay indoors! I had to leave work at 2pm, so missed a big chunk of my work day."

– Melissa, 42, Jordan Springs

Average annual cost, Western Sydney (RCP 4.5, nominal, $m)



Projected costs of heatwaves for Western Sydney (Committee for Sydney 2024)

CASE STUDY

CASCADING AND COMPOUNDING IMPACTS: VICTORIAN HEATWAVE, 2009

In Victoria in 2009, during the lead up to the Black Saturday bushfires, an estimated 374 people died in a heatwave over 27-30 January. This is more than twice the number of people who died in the fires[30].

During this heatwave, there were serious cascading and compounding impacts, including major disruption to energy and transport systems. Rolling blackouts were experienced across much of the state, including Melbourne, over 29 and 30 January, and it has been estimated that over 500,000 residents in Melbourne were without power in the evening of 30 January 2009[31].

The heatwave and power outages caused large numbers of city commuters to be stranded due to train cancellations and signal failures. Other significant impacts on transport infrastructure included buckling of rail tracks and air conditioning failure in buses and trains[32].

News reports said that in addition to the impacts on trains, the power outages caused additional chaos in the city because traffic lights were not working, buildings were evacuated after alarms were tripped and fire crews had to respond to people stranded in lifts[33].

A review found that while individual entities were managing risks within their particular area of responsibility, this did not address the risk of systems failure in a larger and integrated urban system[31].

The Victorian Government has estimated the costs to their economy associated with heatwaves, based in part on the estimated economic impacts of the 2009 and 2014 heatwaves. The estimated costs range from $131 million for a severe heatwave (currently experienced once every two years on average) and $291 million for an extreme heatwave (currently experienced once every 25 years on average), to $1 billion for a 'very extreme' heatwave, expected to occur once every 110 years in the current climate[34]. Heatwaves in Victoria: a vulnerability assessment. Report prepared for the Department of Environment, Land, Water and Planning, VIC.). The 2009 and 2014 events were extreme heatwaves. A 'very extreme' heatwave has not been recorded in Victoria but was based on a heatwave 10% more severe than the 2009 event. All categories of heatwave are expected to become more frequent as the climate changes.

COORDINATION NEEDED TO ADDRESS CONTINUUM OF IMPACTS

Ensuring residents across Greater Sydney both survive and thrive means addressing all the impacts of heat, including health, social, economic and environmental impacts. This means maintaining the ability for people to continue to undertake daily activities associated with work, study, play and rest. It will also mean accounting for inequality in the distribution of heat-related impacts and costs.

Figure 3 illustrates how heat-related risks occur across a continuum, from milder risks associated with hot weather to more severe risks associated with extreme heatwaves. The figure also illustrates how these impacts occur across different sectors. What is not illustrated, is the interrelationship between impacts in different domains. For example relationships between environmental and human health, or the potential for urban system risks to compound and cascade. All these impacts are increasing as the climate changes.

Systematic interventions are needed to address the wide-ranging impacts of heat. Understanding how different parts of the city interrelate is important as one area can support risk reduction in other areas. For example, investments in heat mitigation and adaptation can reduce the reliance on emergency services. It is also worth noting that impacts can be managed at different scales: individual, organisational or network.

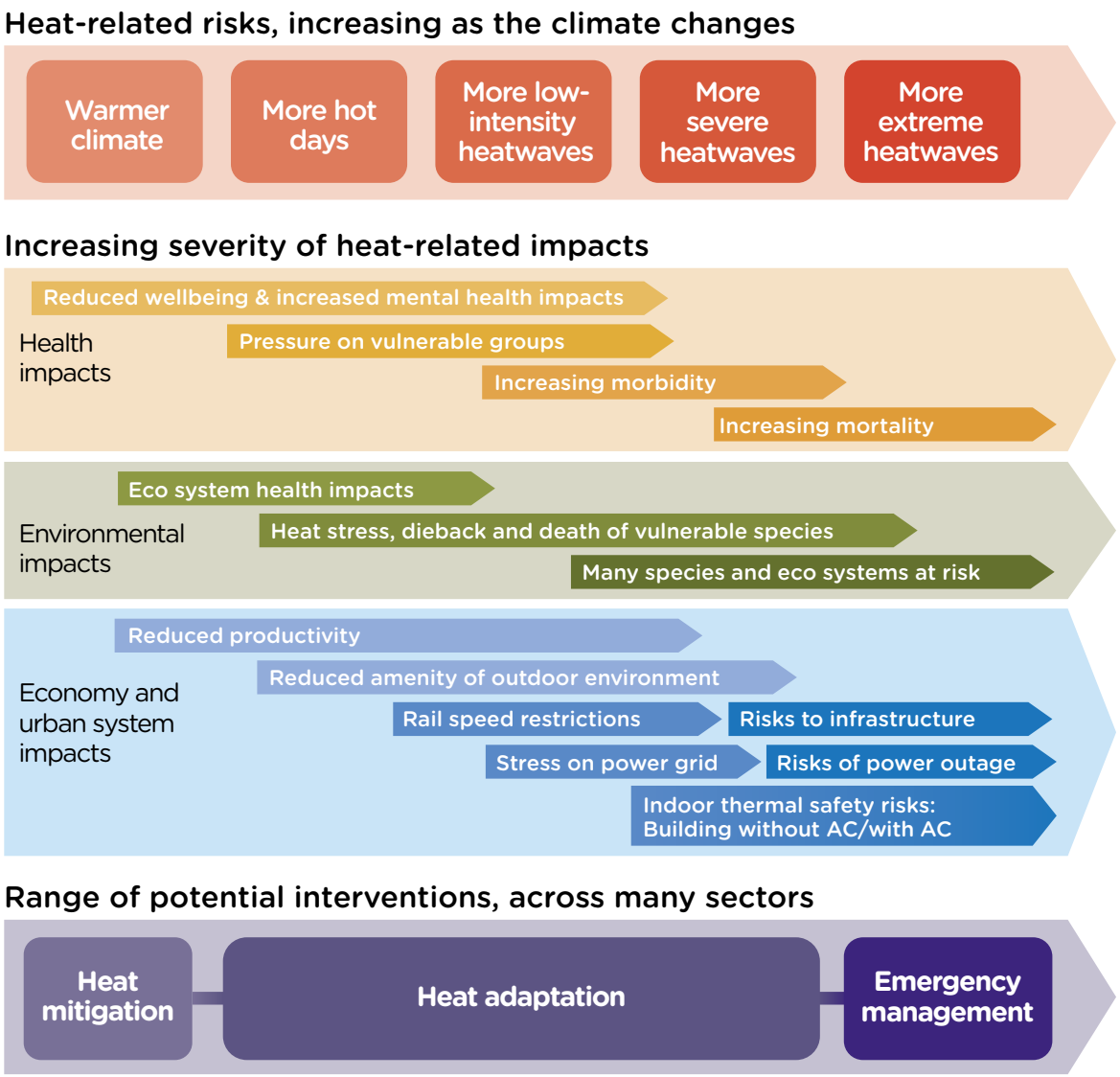


Figure 3: Continuum of heat-related impacts and potential management measures

Sydney resident mowing the lawn on a hot day.

SYDNEY NEEDS TO BE PREPARED FOR SHOCKS AND STRESSES

Extreme shocks of heatwaves

In the event of an unprecedented heatwave, it is likely that Sydney's response capacity would be overwhelmed due to systemic breakdowns of enabling infrastructure including:

- Loss of air-conditioning and lighting in private and public spaces.
- Loss of power to lifts and electronic doors – causing entrapment and loss of access.
- Disruptions to train and traffic signalling - bringing transport to a standstill and increasing risk of traffic incidents and stranded passengers.
- Disruptions to mains water supply and sewerage management systems in high-rise buildings due to potential loss of power.
- Impacts on health and medical infrastructure.
- Potential telecommunications outages.

For the chronic impacts of increased heat

Sydney is also subject to increasing impacts from the chronic stresses of increased heat. In the city, the urban heat island effect exacerbates the impacts of heat.

Assessment of heat vulnerability across Greater Sydney has shown that areas with a high proportion of hard surfaces and low canopy cover are particularly exposed to heat, and these areas often coincide with populations that are particularly vulnerable to heat (e.g. due to underlying health risks), and/or have low adaptive capacity (e.g. due to low income or poor-quality housing). This association can become a reinforcing cycle. Recent studies have indicated that hotter conditions reduce the likelihood of meeting daily activity targets (via walking for transport), increasing the risks of developing chronic conditions like type 2 diabetes.

Addressing these issues needs a systematic and coordinated approach.

Listening to Communities

"In January 2024 I had an appointment to undergo an MRI scan. When I arrived, I was informed the MRI machine had overheated due to consecutive days of above 40-degree temperatures. The centre advised they will reschedule the appointment for the next day, but they called the next morning to advise that the machine was still not operating, and they weren't sure when it would be in operation. I never expected an MRI machine could be affected by heat, and the whole experience was stressful when I already had a lot on my mind regarding my health."

– Siobhan, 30, Blue Mountains

GOVERNANCE IS EMERGING

The current and future risks of heat and heatwaves are identified in plans and strategies at all levels of government.

At national level:

- The National Climate Risk Assessment (first pass assessment report) identifies risks of increased frequency of large-scale heatwaves and record-high temperatures, with consequences to human health and wellbeing, environment, infrastructure, economy and social cohesion.
- The National Health and Climate Strategy (Australian Department of Health and Aged Care 2023) states "Heat is one of the most significant climate risks to health and wellbeing in Australia",

At state level in NSW:

- The NSW Climate Change Adaptation Strategy (2022) identifies heatwaves as a key climate-related risk for NSW.
- The State Disaster Mitigation Plan (NSW Reconstruction Authority 2024) identifies heatwaves as a hazard.

In the Greater Sydney region:

- The Greater Sydney Region Plan (Greater Cities Commission 2018) includes Objective 38: "Heatwaves and extreme heat are managed" and identifies an objective to "Mitigate the urban heat island effect and reduce vulnerability to extreme heat". The same objective carries through to the District Plans.
- The Resilient Sydney Strategy for City Resilience (2018) identifies extreme heat as Sydney's biggest risk in terms of shocks.
- WSROC's Turn Down the Heat Strategy and Action Plan (2018) focuses on heat-related risks for Western Sydney.

At local government level within Greater Sydney:

- Many councils' Local Strategic Planning Statements pick up on the District Plan objectives to mitigate the urban heat island effect and reduce vulnerability to extreme heat.
- Approximately two thirds of Greater Sydney councils have now completed a climate change adaptation plan, sustainability plan/strategy, resilience strategy or similar, which identifies the risk of heat or heatwaves and includes some relevant actions to address this risk (Civille 2023).

City Plan Codesign Workshop.

Broad frameworks are in place

There are existing frameworks, strategies and methods for managing climate-related risks, disasters and extreme weather emergencies. These are summarised in Table 1.

Table 1: Summary of policies, strategies and agencies responsible for managing heat-related risks.

	CLIMATE RESILIENCE AND ADAPTATION	DISASTER RISK REDUCTION, AND DISASTER RECOVERY	EMERGENCY MANAGEMENT	HEATWAVE WARNINGS AND INFORMATION
National frameworks	National Climate Resilience and Adaptation Strategy 2021 – 2025 (Department of Climate Change, Energy, the Environment and Water, 2021)[53]* National Health & Climate Strategy (Department of Health and Aged Care, 2023)	National Strategy for Disaster Resilience (Council of Australian Governments, 2011) Australia's National Disaster Risk Reduction Framework (Department of Home Affairs, 2018)	Australian Government Crisis Management Framework (AGCMF).	Heatwave forecasting and warning service
Key national agencies	Department of Climate Change, Energy the Environment and Water (DCCEEW) Department of Health and Aged Care	Australian Institute for Disaster Resilience (AIDR) National Emergency Management Agency (NEMA)	Department of the Prime Minister and Cabinet; NEMA	Bureau of Meteorology (BOM)
State government policies and programs	Climate Change Policy Framework (NSW Government, 2016) Climate Change Adaptation Strategy (NSW Government, 2022) Greater Sydney Region Plan (NSW Government 2018)	NSW State Disaster Mitigation Plan (NSW Reconstruction Authority 2024)	State Emergency and Rescue Management Act 1989 State, regional and local EMPLANs Heatwave Subplan	Public health alerts, including 'Beat the Heat' public health information.
Key state agencies	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	NSW Reconstruction Authority (NSWRA), Department of Communities and Justice (DCJ) Department of Planning, Housing and Infrastructure (DPHI)	State Emergency Management Committee (SEMC) NSW Premier's Department	NSW Health

*will be superseded by the forthcoming National Adaptation Plan[54]

Beyond the established frameworks in Table 1, there are many examples of initiatives underway to address heat-related risks at a local level. For example, many local councils are assessing climate risks and preparing resilience and adaptation plans. Some are trialling measures such as cool centres, heatwave communications and community engagement focused on building community heatwave preparedness. There is more information about these actions in the Heatwave Management Guide[35]. A challenge for local government is that many aspects of their role are not clearly articulated in the established frameworks listed in Table 1. The Heatwave Management Guide only partially addresses this challenge - there is still a need for improved coordination between different levels of government.

Many organisations are taking action on heat:

At national level, the Australian Bureau of Meteorology has developed a nationally consistent heatwave forecasting and warning service. This commenced with a pilot in 2014 and the warning service commenced in 2021.

At state level, one of the most visible initiatives is NSW Health's 'Beat the Heat' resources, designed to communicate heat-related risks and personal preparedness strategies to the community.

The Greening our City Program is another well-known initiative. This program has dedicated $97.5 million from 2019 to 2030 to support urban greening outcomes across Greater Sydney. This includes grant funding to councils, strategic partnerships with non-government organisations, canopy and heat data acquisition, and council capacity building programs.

There are also some important commitments in recent strategies:

- The NSW Climate Change Adaptation Strategy (2022) includes actions focused on developing metrics, assessing risks, adaptation planning and decision making.
- The NSW State Disaster Mitigation Plan (NSW Reconstruction Authority 2024) identifies tools and actions that would reduce heat exposure and vulnerability.

Local governments in Greater Sydney have been undertaking a wide range of actions. A few examples from the many initiatives underway are:

- Place-based heat research: for example, several councils have completed 'Benchmarking Heat' studies mapping temperatures across their local government area, based on both surface and air temperature measurements[51]. These have provided important insights on microclimate in different locations.
- Heat mitigation: for example, over 2020-2022, Greening our City grants provided approximately $30 million to councils for greening projects including tree planting in parks, streets, town centres and active transport corridors, and in 2022, the Greener Neighbourhoods grant program supported 28 councils across Greater Sydney to strategically plan for and manage urban forests in their local government area[36].
- Planning controls: Penrith City Council has adopted planning provisions for urban heat in their Local Environment Plan and Development Control Plan.
- Cool centres: Blacktown City Council and the City of Sydney – in collaboration with others –have been trialling cool centres. In Blacktown these are located at indoor venues, while the City of Sydney has trialled a pop-up outdoor cooling hub.
- Community workshops: for example, Willoughby City Council has been working with residents of apartment buildings to build resilience, including preparedness for heatwaves.

In the academic sector, all Sydney's major academic institutions are working on research programs and initiatives related to heat. The University of NSW has 'High Performance Architecture' research cluster focused on microclimate and urban heat mitigation and adaptation, the University of Sydney has 'Heat and Health Research Incubator', Macquarie University has a 'Smart Green Cities Research Centre', while the University of Western Sydney has completed several local heat studies and demonstration projects focused on heat mitigation with local councils in Sydney.

In the **community services sector,** the Australian Red Cross is a prominent organisation working to improve community disaster preparedness, including for heatwaves. They have developed a range of resources to help individuals, households and communities prepare for disasters. Several Greater Sydney councils have engaged Red Cross to offer free RediPlan workshops to their community, and they have also been working in partnership with Blacktown City Council at their cool centres. There are many other local organisations involved in similar initiatives.

The Australian Council of Social Services (ACOSS) and Sweltering Cities are both active in community research and advocacy around heat. Their community surveys have provided valuable insights into people's lived experiences with heat.

Key industry players are addressing heat in their strategic planning - for example Endeavour Energy's Resilience Strategy[37] includes consideration of heat-related risks. Sydney Water has developed a strategic study on the role of water in mitigating urban heat in Western Sydney[38]. The Green Building Council of Australia's Green Star Communities rating tool includes a credit for projects that reduce the contribution of the project site to the heat island effect[39].

COORDINATED ACTION REMAINS A SIGNFICANT NEED

In 2018, WSROC's Turn Down the Heat Strategy and Action Plan brought together a cross-disciplinary group of stakeholders to increase awareness and facilitate a more coordinated response to the challenges of heat in Western Sydney, stating: "What is now urgently needed is coordination and action."

Six years on, many relevant actions are underway by various organisations, yet there remains a significant need to step up the level of action and the degree of coordination, to ensure that heat risks are being addressed comprehensively and effectively. Since WSROC's 2018 strategy, many others have continued to call out the needs for coordination and action.

In Sydney specifically:

- The Resilient Sydney Strategy (2018) included a flagship action supporting WSROC's Turn Down the Heat Strategy and ongoing action including the Cool Suburbs rating tool.
- The Committee for Sydney's Agenda for Sydney (2021) includes an item "Design Western Sydney to Mitigate Heat."
- The Committee for Sydney is also driving collaborative research and engagement with industry on the economic costs of heatwaves through their "Burning Money" report (2024).
- Sweltering Cities was founded in 2020, focused on urban heat. Sweltering Cities is campaigning for heatwave safe homes, cool suburbs, improved bus stops and better heatwave emergency strategies.
- Sydney Alliance has called for heatwave planning to be included in NSW's Climate Change Fund.

At national level:

- The Australian Medical Association (AMA) declared climate change a health emergency in 2019.
- The Royal Australian College of General Practitioners' 'Impact of Climate Change on Human Health Position Statement' "recognises climate change as a key public health issue and commits to mitigation and adaptation strategies as an organisation and promoting and advocating for these among general practitioners (GPs), healthcare organisations and the community."
- The Australian Council of Social Services (ACOSS) Community Sector Climate Declaration calls for "rapid, fair and inclusive action on climate change". Based on community survey findings in 2023 and 2024, ACOSS has called for government action to address heat-related risks, particularly for people experiencing financial and social disadvantage, especially those living with disability or a health condition.

Importantly, the Australian Government has recently signalled an intention to act at a national level on minimising the health impacts of heat. The National Health and Climate Strategy[40] includes Action 6.1: "The Australian Government will work with states and territories to develop and publish a National Heat-Health Action Plan which promotes a nationally consistent approach to minimising the health impacts of heat."

This Heat Smart City Plan will help

This Heat Smart City Plan will help advance coordinated action by:

Focusing on heat and its unique challenges

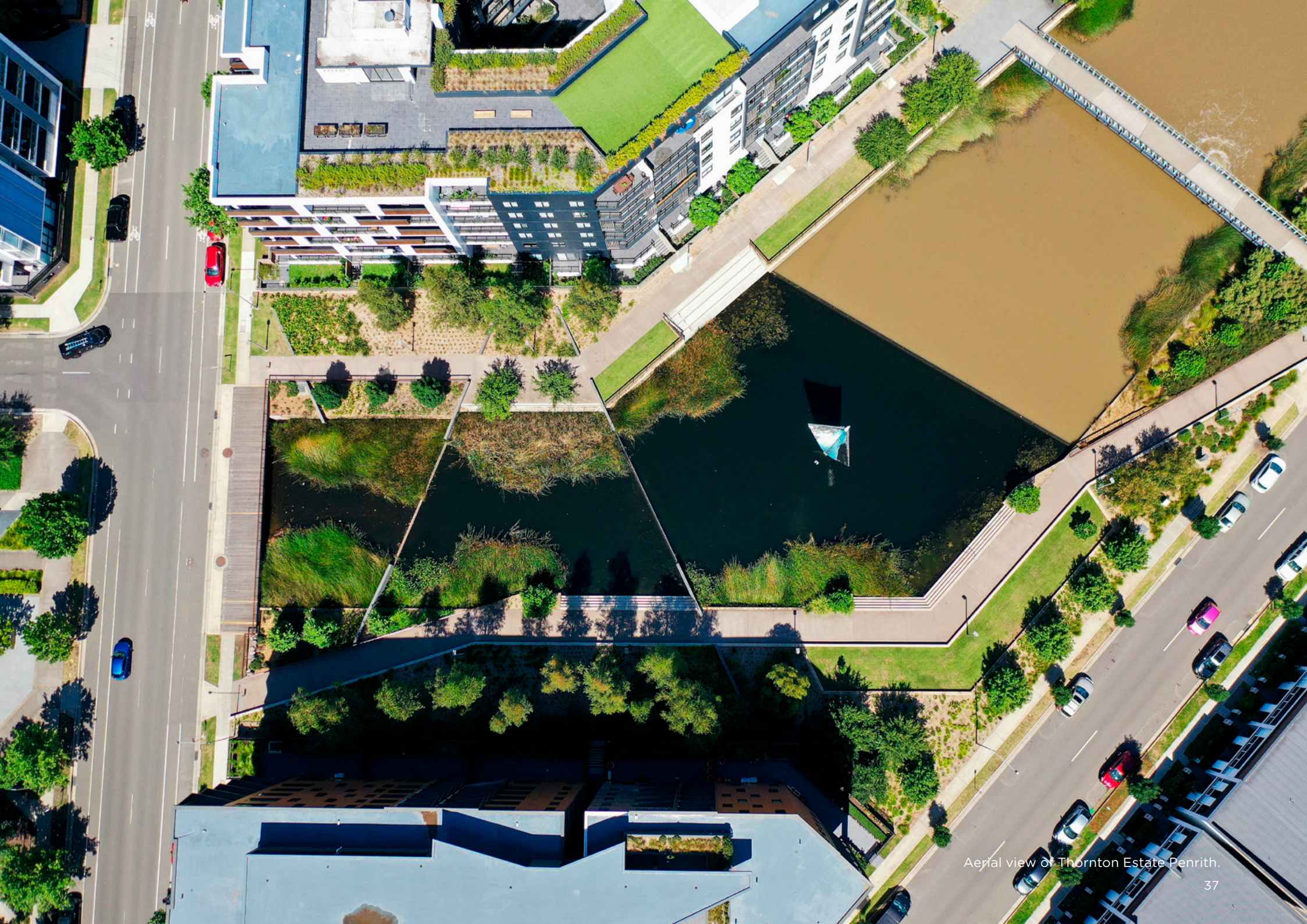
There is substantial work underway in climate change adaptation, resilience, emergency management and disaster preparedness, and much of this is relevant to heat. A multi-hazard approach is typically recommended, as natural hazards do not always occur in isolation. Yet, a focus on heat is also helpful, as heat poses unique challenges, distinct from other kinds of shocks and stresses.

Considering heat at a regional scale

Heatwaves are a regional-scale phenomenon and their impacts spread across geographic and administrative boundaries. Therefore, a regional scale approach is useful to grapple with boundary-crossing issues. The Greater Sydney region is also diverse, including local climate zones, a wide range of urban and peri-urban development, and a diverse community.

Taking a multi-sectoral approach

By bringing together stakeholders from multiple sectors, the Heat Smart City Plan grapples with the systematic risks and impacts of heat. Like other natural hazards, heat can cause complex cascading impacts on multiple systems. Therefore, no one organisation can address the challenges posed by heat on its own. Many organisations can play a role, and they need to work together.



Aerial view of Thornton Estate Penrith.

Participants at Taskforce workshop.

SECTION 2:

How this Plan was developed

HOW THIS PLAN WAS DEVELOPED

INTEGRATED APPROACH TO HEAT MANAGEMENT

Building a heat resilient city calls for an integrated, whole-of-community approach under the prevention, preparedness, response and recovery (PPRR) principles. An integrated approach to managing heat risks encourages partnerships, shared responsibility, better understanding of the risk environment, and an adaptive and empowered community that acts on this understanding. Acknowledgement of the need for an integrated approach underpinned the development of the Plan.

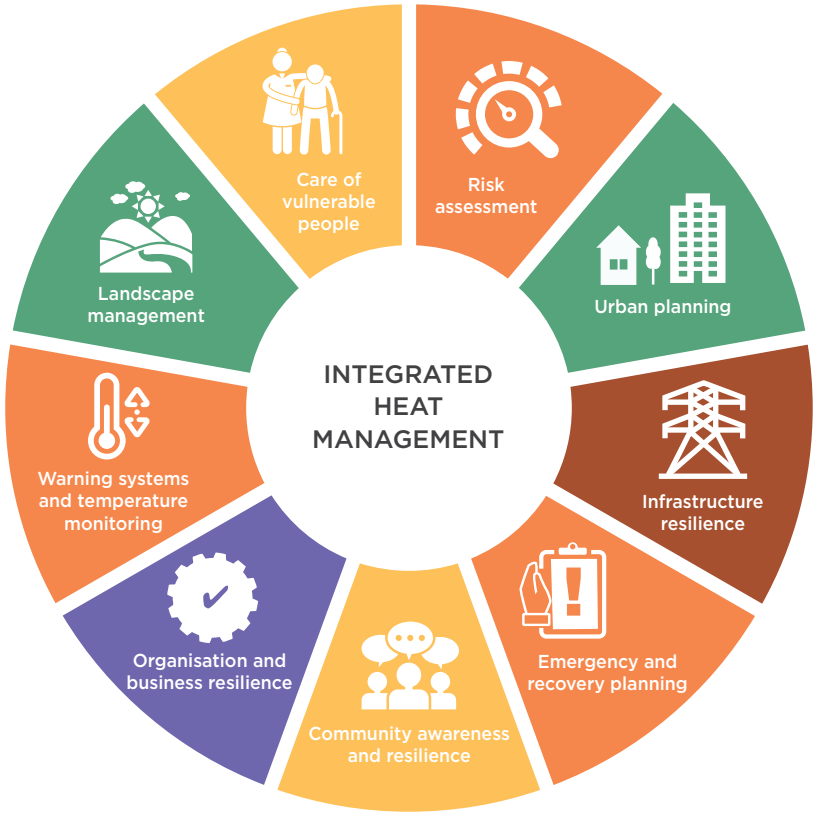


Figure 4 outlines the diverse range of areas that contribute to holistic heat management

THE GREATER SYDNEY HEAT TASKFORCE

The Greater Sydney Heat Taskforce is a collaboration of organisations and businesses across health, planning and design, infrastructure, emergency management and the community sectors. Its purpose is driving coordinated action towards long-term systemic heat resilience for Greater Sydney through the development of this Plan and the subsequent Implementation Plan.

The Taskforce was facilitated by WSROC and Resilient Sydney through funding from the joint Australian Government–NSW Government National Partnership Agreement on Disaster Risk Reduction.

The Taskforce includes the following organisations:

- Australian Department of Climate Change, Energy, the Environment and Water
- Australian Red Cross
- Blacktown City Council
- Business Western Sydney
- Committee for Sydney
- Endeavour Energy
- Energy and Utility Services Functional Area
- Green Building Council of Australia
- Liverpool City Council
- NSW Department of Climate Change, Energy, the Environment and Water
- NSW Department of Planning, Housing and Infrastructure
- NSW EPA
- NSW Health
- NSW Police (SEOCON)
- NSW Reconstruction Authority
- Property Council of Australia
- Resilient Sydney
- Sweltering Cities
- Swiss Re
- Sydney Water
- Transport for NSW
- Western Sydney Community Forum
- WSROC

Expert reference panel

- University of New South Wales, Dr. Patrick Harris
- University of New South Wales, Prof. Mat Santamouris
- University of Sydney, Prof. Ollie Jay
- University of Sydney, Prof. David Schlosberg
- Western Sydney University, Prof. Nicky Morrison
- Western Sydney University, Prof. Sebastian Pfautsch

Taskforce codesign group

(in addition to organisations listed under Taskforce Steering Committee and Taskforce Expert Reference Panel)

- Ausgrid
- Australian Institute of Landscape Architects
- Bradfield Development Authority
- Camden Council
- Campbelltown City Council
- City of Sydney
- COTA NSW
- Department of Communities and Justice
- Hawkesbury City Council
- Homes NSW
- NCOSS
- NEMA
- Nepean Blue Mountains Local Health District
- NSW Australian Medical Association
- NSW Treasury
- Penrith City Council
- Peppercorn Services
- Powerhouse Museum, Parramatta
- South Western Sydney Local Health District
- Sydney Local Health District
- Sydney Alliance
- Western Sydney Local Health District
- St John's Ambulance

CO-DESIGN PROCESS

To develop this plan, the Taskforce engaged with over 40 organisations and 373 individuals over a year-long period.

To ensure success of the plan, the iterative, codesign process centred around a 'theory of change' line of enquiry and evaluation. Theory of change-based questioning and evaluation provides a powerful logical method for determining which actions will have the greatest impact.

The Taskforce codesign group worked through a three-cycle process to determine the outcomes and actions required to enable people living in Greater Sydney to survive and thrive in a warming climate and during extreme heat events. This ordered approach enabled actions to emerge out of the growing understanding of the required change.

Throughout the process, the Taskforce has evaluated the process through surveys of participants. In July 2024, 85% of participants agreed that the Taskforce model was effective for the design of the Heath Smart City Plan, with the majority of those in strong agreement. Over 89% of participations agreed that the process was a genuine opportunity to provide input into the plan. Additionally, informal feedback reported a robust process that successfully harnessed the power of the collective to enable change.

From the Taskforce

"Participation in the process has helped me guide the direction of policy within my organisation"

– Taskforce member

Cycle 1

FOCUS ON:

- Vision
- Outcomes by 2030
- Intermediate outcomes

Taskforce #1 – 4 August 2023

Wide Workshop 1 – 11 October 2023

Deep dive session – 19 October 2023

Deep dive session – 26 October 2023

Cycle 2

FOCUS ON:

- Recommendations for the next 5 years

Taskforce #2 – 11 December 2023

Wide Workshop 2 – 13 February 2024

Deep dive session – 15 February 2024

Deep dive session – 20 February 2024

Cycle 3

FOCUS ON:

- Refine recommendations
- Goverance
- Positioning in the public-facing document
- Evaluation

Taskforce #3 – 25 March 2024

Wide Workshop 3 – 9 April 2024

Taskforce #4 – 23 May 2024

One-on-one briefings – June & July 2024

Taskforce #5 – 24 July 2024

Building momentum around managing heat risk

Beyond developing the plan, bringing together these diverse stakeholders focused on heat has built momentum to create new programs and share work in progress. Members of the Taskforce codesign group have been involved in the following outcomes:

- Creation of the NSW interagency urban heat committee
- Release of Committee for Sydney's "Burning Money: the rising costs of heatwaves for Western Sydney"
- Review of the NSW heatwave emergency sub plan
- Assistance from the Taskforce reference panel to support energy providers highlighting heat resilience in their regulatory proposal
- Collaboration between local councils on proposed changes to the planning system
- Scaling up of the NSW Beat the Heat campaign
- Submission to the NSW inquiry into the Planning System and the impacts of climate change on the environment and communities
- Development of agreed heat risk messaging.

City Plan co-design workshop.

Woman using hand held fan to keep cool.

SECTION 3:

The Heat Smart City Plan

THE HEAT SMART CITY PLAN

UNDERSTANDING THE PLAN

The Heat Smart City Plan was developed using a Theory of Change process. A Theory of Change is a logical approach to determine which actions will have the greatest impact in achieving an intended goal. For the Heat Smart City Plan, this approach has been instrumental for mapping and understanding the complex multi-faceted issue that is heat, as well as fostering collaboration and a sense of shared purpose amongst a diverse stakeholder group.

The first step in developing the Heat Smart City Plan was identifying an agreed long-term goal (**vision**) that Taskforce participants could work towards.

The Theory of Change process then works backwards from this goal to identify the conditions (**long term and intermediate outcomes**) that must be in place for the goal to be achieved.

This provides the basis for identifying what type of activities or interventions (**key directions and focus areas**) are needed to deliver the outcomes identified as preconditions for achieving the long-term goal.

The Taskforce process used this framework to put forward **recommended actions** for implementation over the next five years.

Figure 5 shows the relationship between these Theory of Change elements, and how they cascade towards the final recommendations outlined in the Heat Smart City Plan.

HOW TO READ THIS PLAN

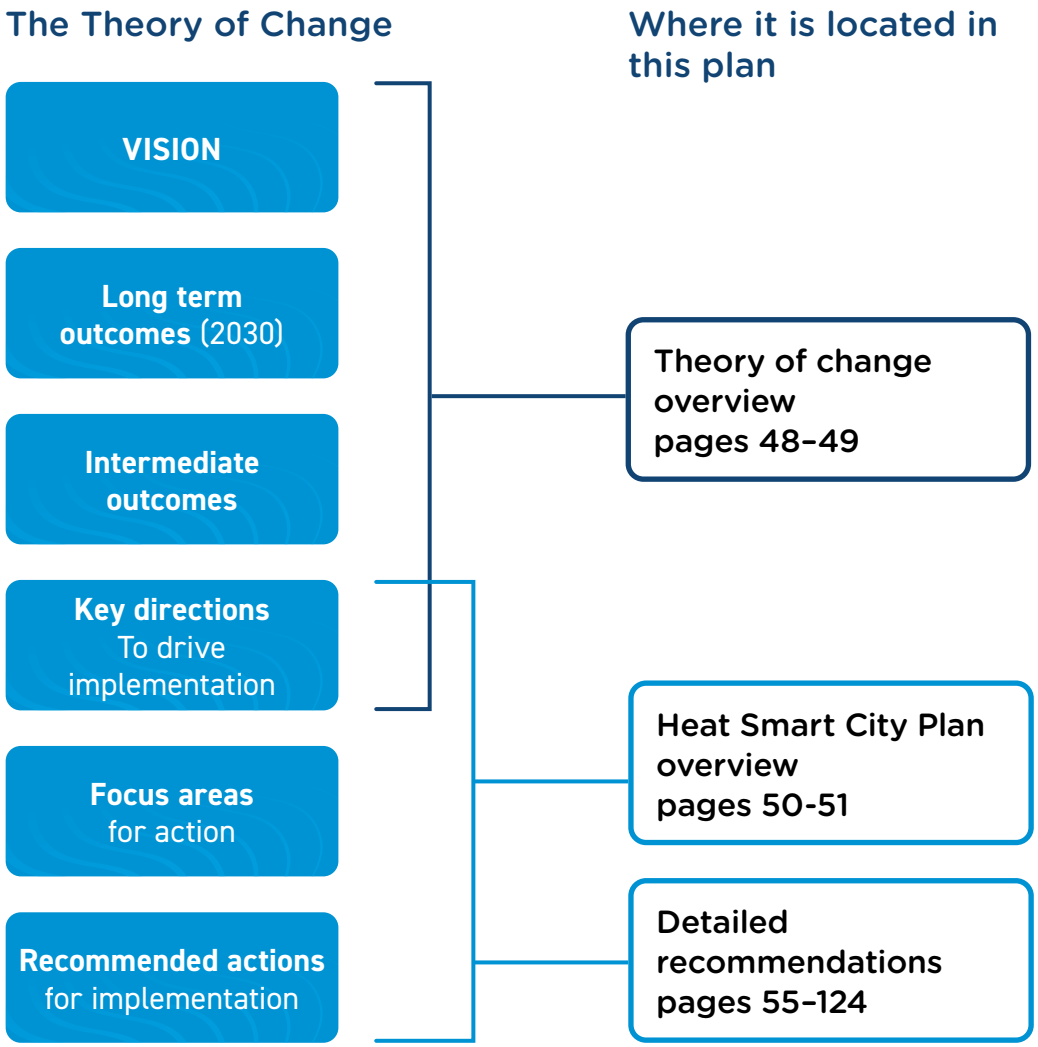


Figure 5: How to read this Plan: Linking the Theory of Change to Plan components.

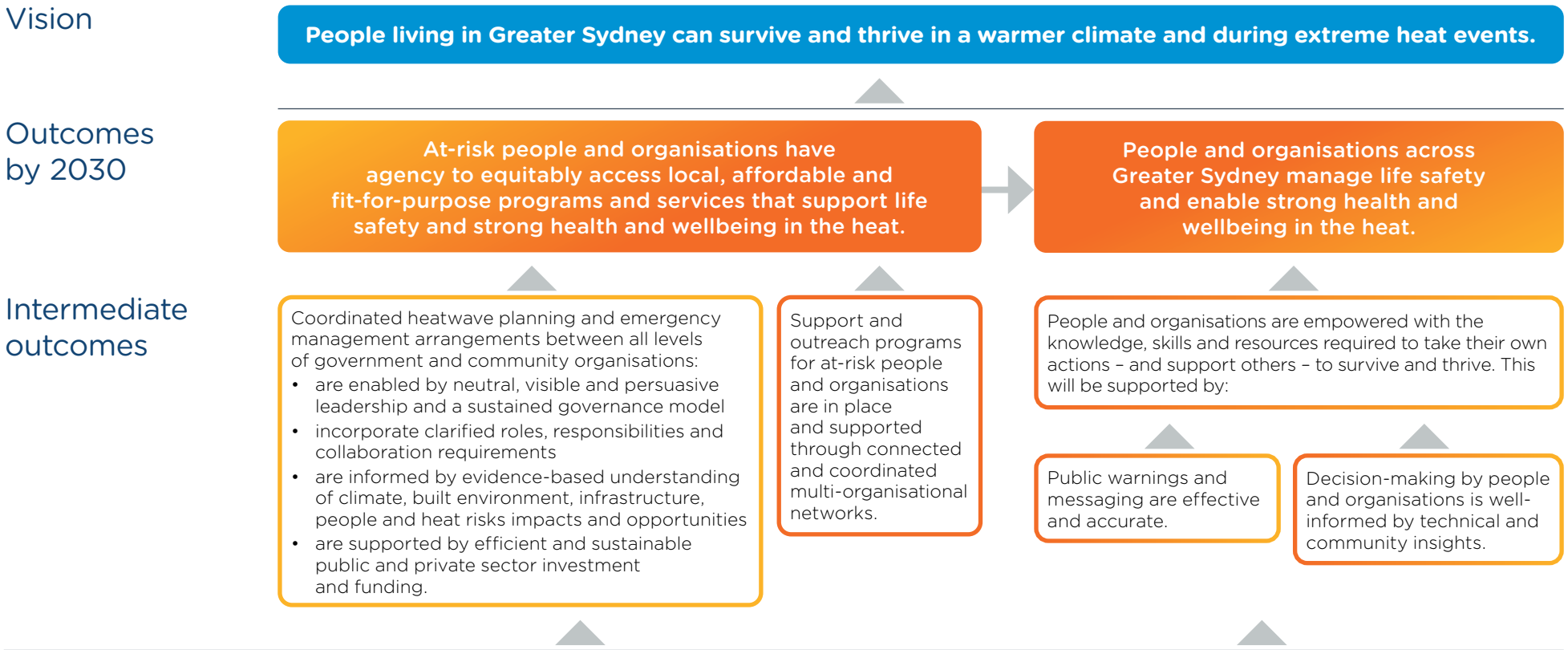
Principles

The Heat Smart City Plan is underpinned by the following principles:

- Acknowledges and responds to the fact heat risk is an all-of-society issue
- Leverages and/or gives consideration to relevant existing plans and strategies
- Acknowledges and reflects resilience-based approaches to emergency management, involving all levels of government and sectors of the community
- Acknowledges and responds to the unique needs of different communities (e.g. First Nations, CALD and people with a disability)
- Incorporates 'what has worked' and 'what is working' (e.g. indigenous knowledge and learnings from elsewhere) into tailored and localised solutions appropriate to Greater Sydney contexts.

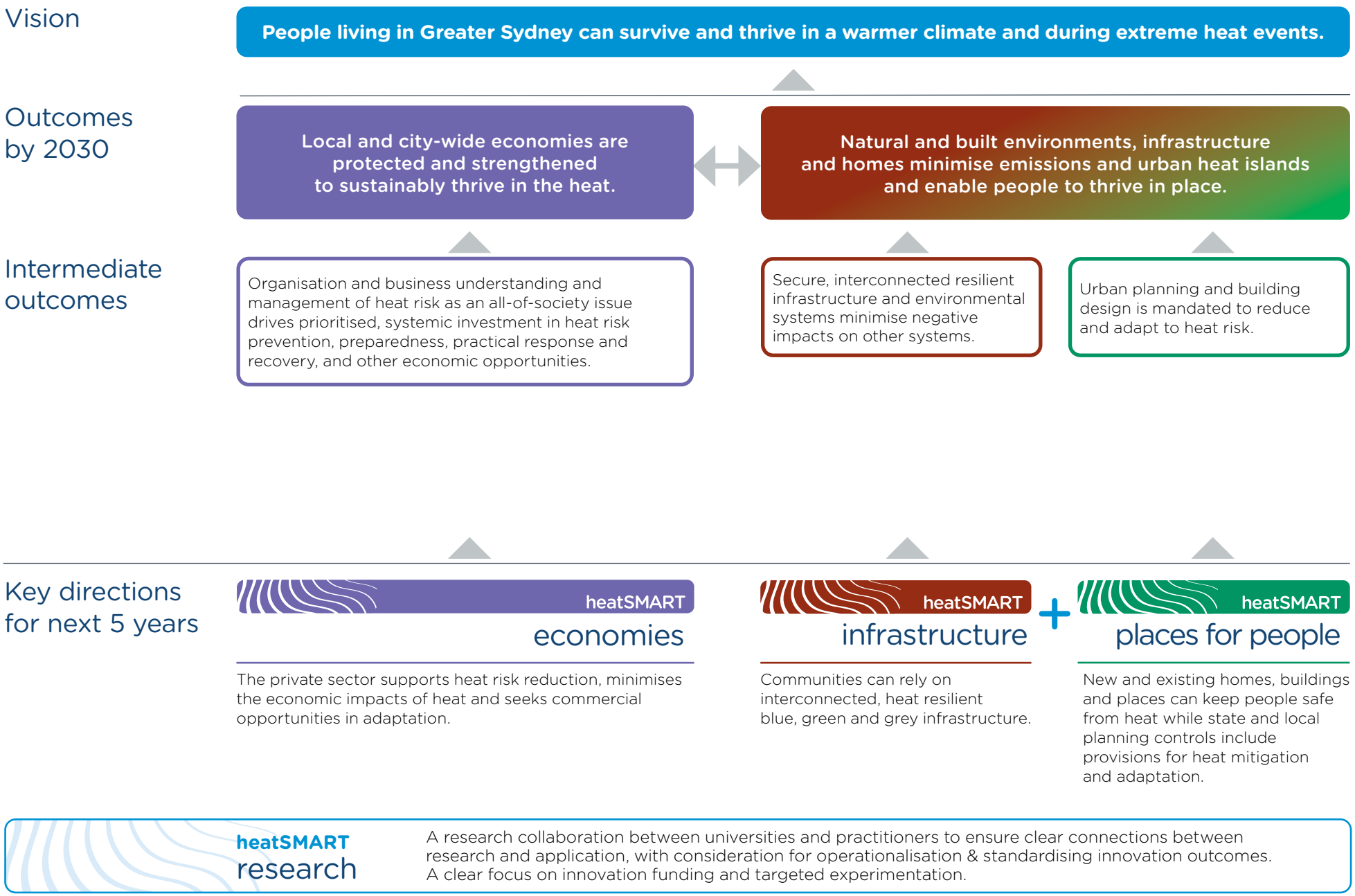
Taskforce members discussing City Plan development.

HOW THEORY OF CHANGE UNDERPINS THE HEAT SMART CITY PLAN



heatSMART research

A research collaboration between universities and practitioners to ensure clear connections between research and application, with consideration for operationalisation & standardising innovation outcomes. A clear focus on innovation funding and targeted experimentation.


Vision
People living in Greater Sydney can survive and thrive in a warmer climate and during extreme heat events.
Outcomes by 2030
Local and city-wide economies are protected and strengthened to sustainably thrive in the heat.
Natural and built environments, infrastructure and homes minimise emissions and urban heat islands and enable people to thrive in place.
Intermediate outcomes
Organisation and business understanding and management of heat risk as an all-of-society issue drives prioritised, systemic investment in heat risk prevention, preparedness, practical response and recovery, and other economic opportunities.
Secure, interconnected resilient infrastructure and environmental systems minimise negative impacts on other systems.
Urban planning and building design is mandated to reduce and adapt to heat risk.
Key directions for next 5 years
heatSMART
economies
The private sector supports heat risk reduction, minimises the economic impacts of heat and seeks commercial opportunities in adaptation.
heatSMART
infrastructure
Communities can rely on interconnected, heat resilient blue, green and grey infrastructure.
+
heatSMART
places for people
New and existing homes, buildings and places can keep people safe from heat while state and local planning controls include provisions for heat mitigation and adaptation.
heatSMART
research
A research collaboration between universities and practitioners to ensure clear connections between research and application, with consideration for operationalisation & standardising innovation outcomes.
A clear focus on innovation funding and targeted experimentation.

PLAN OVERVIEW

This diagram shows the detailed recommended actions for each of the key directions.
Detailed descriptions for the recommended actions are on the pages that follow.

● Scoping ●● Committed – seeking funding ●●● Committed – delivery planning ●●●● Implementation (*For full definition of status key categories refer to page 53)

heatSMART

decisions

Coordinated City

Enduring, collaborative approach improves heat risk decision making for Greater Sydney

1. Greater Sydney Heat Taskforce | ●●
Coordinate the establishment of a governance arrangement to guide delivery of the Heat Smart City Plan, as part of broader multi-hazard disaster adaptation planning.

2. Heat Resilient Community of Practice | ●●
Establish Community of Practice for professionals working on the issue of heat resilience, to support Heat Smart City Plan delivery.

3.Listen to Communities | ●●
Engage with community and reflect and report on community input in delivery of the Heat Smart City Plan.

Benchmarking Heat

Shared understanding and monitoring of heat and heat risk improves action

4. Heat Risk Assessment | ●●
Adopt agreed heat risk assessment frameworks, incorporating emerging heat risk assessment models that support place-based decision-making.

5. Triggers for Action | ●
Develop a set of heat impact thresholds and triggers relating to community health, business and service continuity, and infrastructure operations.

6. Measure Heat Impacts | ●
Develop and endorse agreed heat impact indicators to support consistent reporting, including:

- Economic impacts
- Productivity loss
- Health (e.g. heat related illnesses coming through emergency departments)
- Community wellbeing
- Environmental wellbeing
- Infrastructure resilience

heatSMART

places for people

Heat Safe Homes and Buildings

New and existing homes, and buildings are heat responsive and can keep people safe from heat

7. Heat Safe Social Housing | ●●●●
Retrofit social housing properties to improve thermal performance and minimise heat stress.

8. Heat Safe Rentals | ●
Set and enforce thermal performance standards for residential rental accommodation, incl. retrofit incentives targeting areas of greatest risk.

9. Heat Safe Builds | ●
Inform thermal safety requirements within the National Construction Code to ensure new buildings protect occupants from extreme temperature.

10. Heat Smart Home Improvements | ●●
Deliver a community education campaign to improve household knowledge and confidence in making cool choices for their home and garden.

Heat Smart Planning

Integrated heat mitigation and adaptation is required in state and local planning controls

11. Cool Design Guidance | ●●●
Develop, publish and promote guidance and tools for government, industry and community to mitigate heat through planning and design.

12. Cool Suburbs Assessment | ●●
Deliver a rating and assessment tool to support industry and government deliver cool homes and suburbs in line with the latest science.

13. Cool Planning | ●
Review the NSW Planning System to identify where heat risk mitigation and adaptation measures need to be adopted into state and local planning controls and land-use overlays.

heatSMART

economies

Heat Smart Marketplace

The private sector supports heat risk reduction, minimises the economic impacts of heat and seeks commercial opportunities in adaptation.

14. Intergenerational Report | ●
Publish impacts and economic costs of heatwaves in 2028 NSW Intergenerational Report (aggregate risk), and biennial departmental climate change impacts, risks and adaptation statements (enterprise risk disclosure) to inform the NSW budget and policy development.

15. Burning Money Brief | ●●●●
Build awareness among key public and private sector decision makers in NSW regarding the economic impacts of heat and priority recommendations for action.

16. Sovereign Heat Risk | ●
Engage with the Australian Government regarding recognition of heat as a peril through pre (Treasury) and post event (Disaster Management) channels.

17. Heat Smart Insurance | ●
Raise awareness of growing heat-driven risk exposure and application of appropriate insurance solutions to build social and economic resilience.

18. Heat Smart Innovations | ●
Identify, test and roll out new solutions to address heat risk with a focus on skills building, new technology, product development.

Heat Smart Work

Capacity built for effective heat risk planning by business and industry

19. Heat Safe Work Places | ●
Build capacity of organisations, business and industry stakeholders to plan, prepare for and respond to heat risks. Including integration of heat risk as part of BAU, business continuity, Duty of Care and WHS in all policies.

20. Heat Safety Workplace Pilot | ●●●
Develop a Heat Safety Strategy for academics, professional staff and students working on Western Sydney University campuses.

heatSMART

infrastructure

Heat Smart Infrastructure

Interconnected, resilient infrastructure enables communities to survive and thrive

21. Climate Ready Infrastructure | ● ●
Establish collaboration forums with the essential infrastructure sector to explore barriers and build opportunities for resilience across infrastructure streams.

22. Heat Smart Movement | ●
Investigate opportunities for climate resilient passenger networks including: cool transport stops, green active corridors, heat-resilient infrastructure, and heat safe operations.

23. Heat Smart Energy | ●
Build evidence and knowledge base to understand extreme heat impacts on energy network resilience, and the service needs of customers during heatwaves.

24. Emission Reductions and Energy Resilience Program | ● ● ● ●
Invest in climate change mitigation and capacity building initiatives that support communities and business to reduce emissions and increase energy security.

25. Green-Blue Infrastructure Network | ●
Develop a coordinated approach to green and blue infrastructure delivery and maintenance, accompanied by tools and guidance to support best practice.

heatWAVE

ready

Heatwave Ready City

Clear governance arrangements, funding and guidance supports effective heatwave management.

26. Heatwave in Disaster Adaptation Plan | ● ●
Reflect Heat Smart City Plan actions in multi-hazard Disaster Adaptation Plans (DAPs) to drive government, business, household and service provider preparedness.

27. NSW Heatwave Subplan Review | ● ● ● ●
Review the NSW Heatwave Subplan consulting widely and using the Heat Smart City Plan as a reference.

28. Emergency Plan Stress Test | ●
Conduct recurring local and city-wide multi-agency heatwave emergency scenario exercise to inform and improve arrangements.

29. Heatwave Response Protocols | ●
Develop and implement evidence-based protocols, templates and guidance to ensure best-practice heatwave emergency planning at all levels.

30. Cool Centres | ●
Initiate a partnership between state government, councils, community sector and industry that tests and evaluates examples of Cool Spaces for funding and standardisation.

31. National Disaster Funding | ●
Declare heatwave as an eligible disaster under the National Disaster Funding Arrangements.

Heatwave Ready Communities

Communities and organisations are empowered to take action to build community resilience, reduce risks and manage emergencies.

32. Beat the Heat | ● ● ●
Develop and circulate annually updated heat risk and safety communications resources and toolkits as part of ongoing awareness campaign.

33. Heat Smart Community Services | ●
Deliver training, tools and resources with community stakeholders, organisations and decision-makers to build their capacity to manage heat risk.

34. HeatWatch App | ● ●
Personalised heat-health risk alert app with accompanying evidence-based cooling and hydration advice.

35. Heat Smart Healthcare | ●
Develop and deliver training tools and resources for caring professionals including medical, nursing and aged and disability care workers.

36. Social Cohesion Program | ● ●
Measure, understand an d improve social cohesion of Greater Sydney communities (aligning to State Disaster Mitigation Plan).

37. Heatwave Safety Net | ●
Establish check-in program for priority at-risk individuals as part of heatwave management (e.g. Red Cross TeleCross REDi).

38. Heat Smart Learnings | ● ● ● ●
Deliver an interdisciplinary learning program for young people to increase awareness and interest in the different aspects of heat resilience as they intersect across the curriculum.

heatSMART

research

Researchers and practitioners work collaboratively to deliver heat resilient solutions.

39. Collaborative Research | ● ●
Establish Sydney's first Heat Smart City Collaborative Research Program across Sydney's universities, utilities, industry, NGOs, NSW Government, and Greater Sydney local government.

40. Heat Smart Data Base | ● ●
Establish a multi-indexed database of Sydney's dispersed collection of existing information that enables researchers, utilities, industry, government agencies and local government, NGOs to upload open access research, data and case studies to improve the capacity of the region to respond to heat risk.

DETAILED RECOMMENDATIONS

This section provides more detail on the proposed recommendations that emerged through the Taskforce process. These are grouped under six Directions:

- **HeatSMART decisions, page 55**
- **HeatSMART places for people, page 67**
- **HeatSMART economies, page 81**
- **HeatSMART infrastructure, page 93**
- **HeatSMART ready, page 101**
- **HeatSMART research, page 121**

Each Direction, and its related Focus Areas, begins with a detailed description and brief rationale as to why it is considered important by Taskforce stakeholders.

There are a total of 40 individual Recommendations outlined under the six Directions.

Because heat resilience is an emerging issue for our city, the Recommendations outlined in this Plan are at different levels of maturity. Some build on existing programs, while others are new proposals and collaborations that have emerged during the Taskforce process.

To help readers better understand the nature of each Recommendation, the following detail has been provided:

Child cooling off in the water at Penrith Beach.

HOW TO READ THE DETAILED RECOMMENDATIONS

Each detailed recommendation contains the following table after the recommendation information.

Proposed facilitator:

The proposed business or organisation responsible for driving a recommendation. In some instances,
a facilitator has not yet been identified.

Taskforce supporters:

Taskforce organisations who are interested in supporting implementation of a recommendation. Support may take a variety of forms including: advocacy, information sharing, technical expertise, or resourcing (financial or in-kind).

Timing:

Indicates when a recommendation is proposed to take place. In some instances, implementation is already underway. In others, a timeframe has not yet been determined or is likely to change.

Status:

Describes where a recommendation sits on the maturity curve. Recommendations have been categorised into one of four stages:

- **Scoping** | ●
  These recommendations were identified as a need during development of the Plan but require further scoping, for example, to determine scope, feasibility, implementation pathways and/or resourcing required.
- **Committed – seeking funding** | ● ●
  These recommendations are well-defined initiatives that have in-principle commitment, but require funding to progress further.
- **Committed – delivery planning** | ● ● ●
  These recommendations are scoped and funded but require final project planning or agreements between partners to commence.
- **Implementation** | ● ● ● ●
  These recommendations are ready to implement or are already underway.

Scale:

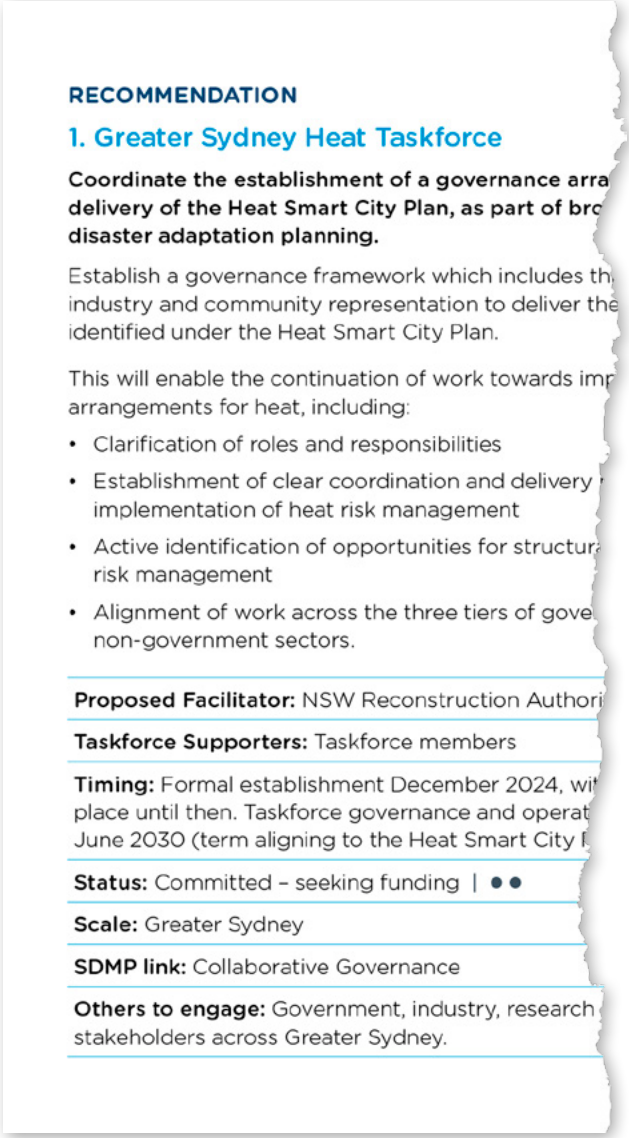
This describes the geographical scale at which a recommendation will be implemented i.e. Greater Sydney, statewide etc. But it also identifies opportunities for upscaling of a recommendation.

SDMP Link:

How this recommendation relates to the NSW State Disaster Mitigation Plan

Others to engage:

Organisations or sectors who should be engaged or consulted as part of the planning and delivery of this recommendation.



RECOMMENDATION

1. Greater Sydney Heat Taskforce

Coordinate the establishment of a governance arra delivery of the Heat Smart City Plan, as part of bro disaster adaptation planning.

Establish a governance framework which includes th industry and community representation to deliver the identified under the Heat Smart City Plan.

This will enable the continuation of work towards imp arrangements for heat, including:

- Clarification of roles and responsibilities
- Establishment of clear coordination and delivery implementation of heat risk management
- Active identification of opportunities for structura risk management
- Alignment of work across the three tiers of gove non-government sectors.

Proposed Facilitator: NSW Reconstruction Authori

Taskforce Supporters: Taskforce members

Timing: Formal establishment December 2024, wit place until then. Taskforce governance and operat June 2030 (term aligning to the Heat Smart City P

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Collaborative Governance

Others to engage: Government, industry, research stakeholders across Greater Sydney.

Example recommendation page with table

Participants at City Plan co-design workshop.

heatSMART

decisions

Heat impacts all parts of Greater Sydney, therefore planning to manage heat risks requires a collaborative approach across sectors.

As heat is a relatively new and rapidly evolving issue, governance, structures, roles and responsibilities and ways of doing are all still immature. Further, there are currently limited and varied methods for quantifying heat related impacts and measuring success.

Organisations working in this area have expressed the need for ways to connect with each other to build issue awareness and share understandings. The need to connect with communities to better understand their needs as well as measure the efficacy of new programs and initiatives was also identified as a priority.

This direction seeks to build collaboration across sectors as our city learns by doing. This includes agreeing on shared definitions, coming together to explore shared challenges, and setting up governance frameworks and data sets for monitoring success.

heatSMART decisions

Focus area: Coordinated City

Enduring, collaborative approaches improve heat risk decision making for Greater Sydney.

Heat impacts our city in complex, cascading and compounding ways.

As our understanding of, and governance arrangements for, managing heat in our city evolves, there is a need to foster collaboration across government, industry and community sectors to ensure our efforts deliver the most efficient, effective outcomes whilst minimising potential negative impacts.

This collaboration should involve:

- Cross-sectoral engagement to establish clear, effective governance arrangements
- Informal networks for sharing professional development and learning-by-doing
- Engaging with communities to understand the impact of policy and program decisions on the ground.

Taskforce representatives at City Plan co-design workshop.

RECOMMENDATION

1. Greater Sydney Heat Taskforce

Coordinate the establishment of a governance arrangement to guide delivery of the Heat Smart City Plan, as part of broader multi-hazard disaster adaptation planning.

Establish a governance framework which includes three tiers of government, industry and community representation to deliver the goals and projects identified under the Heat Smart City Plan.

This will enable the continuation of work towards improving governance arrangements for heat, including:

- Clarification of roles and responsibilities
- Establishment of clear coordination and delivery mechanisms for implementation of heat risk management
- Active identification of opportunities for structural funding for heat risk management
- Alignment of work across the three tiers of government and non-government sectors.

Proposed Facilitator: NSW Reconstruction Authority

Taskforce Supporters: Taskforce members

Timing: Formal establishment December 2024, with transition period in place until then. Taskforce governance and operations to be reviewed in June 2030 (term aligning to the Heat Smart City Plan).

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Collaborative Governance

Others to engage: Government, industry, research and community sector stakeholders across Greater Sydney.

Why it's important

Heat is a wicked problem that touches all parts of our city. Successful planning for and mitigation of heat impacts requires action from a diverse array of stakeholders working collaboratively across different sectors and spatial scales. This complex environment requires ongoing coordination between actors. This will ensure the most effective use of resources and prevent policy conflicts.

Ensuring coordinated arrangements are in place for heat risk management and the delivery of the Heat Smart City Plan was identified as a top priority by the Greater Sydney Heat Taskforce. The Taskforce, as well as broader stakeholders identified the Taskforce model as an opportunity to ensure that Greater Sydney's heat risk is managed with a coordinated and evidence-based approach.

Stakeholders also identified strong alignment between the three tiers of government as a critical need. Effective risk management and response requires strong interoperability and clear roles and responsibilities across federal, state and local governments. Further, collaboration supports efficient flows of information, resources and funding between agencies. Poor alignment results in duplication, wasted time, money and resources.

Governance arrangements for the Taskforce need to include regular review of its membership and ensure arrangements are in place for inclusion of new members as required.

From the Taskforce

"The diversity of stakeholders and skill sets [in the Taskforce] enables effective collaboration, and builds networks and stewardship for the implementation of the plan."

– Taskforce member

RECOMMENDATION

2. Heat Resilient Community of Practice

Establish a Community of Practice for professionals working on the issue of heat resilience, to support Heat Smart City Plan delivery.

The Community of Practice should:

- Be open to stakeholders from state agencies, councils and allied sectors, such as community organisations
- Support establishment of a catalogue of best-practice risk management strategies, case studies, tools and other information for professional use
- Provide ongoing training to upskill key actors in heatwave risk and management as the region's knowledge base grows.

Proposed Facilitator: Collaboration between WSROC and Resilient Sydney
Taskforce Supporters: Taskforce members, local government, universities
Timing: Formal establishment 2025.
Status: Committed – seeking funding | ●●
Scale: Greater Sydney
SDMP link: Capacity and Capability
Others to engage: Local Government NSW, professional associations, other listed in this Plan

Why it's important

Understanding of heat risk is a relatively new issue in Greater Sydney, and one that is rapidly evolving. There is an increasing need for practitioners to connect with others and share information to build the region's understanding and responsiveness to heat risk.

Stakeholders involved in the co-design of the Heat Smart City Plan emphasised the value of issue-based workshops in building networks and facilitating collaboration and knowledge sharing between and across disciplines and sectors.

Taskforce representatives at City Plan co-design workshop.

RECOMMENDATION

3. Listen to Communities

Develop and implement a Community Engagement Strategy to support the successful delivery and refinement of the Heat Smart City Plan (2025–2030).

Proposed Facilitator: Sweltering Cities

Taskforce Supporters: Local government, NSW Reconstruction Authority, Western Sydney Community Forum, Local Government NSW Reconstruction Authority

Timing: Project commences June 2025, with a term aligning to the City Plan (2030). Arrangements to be reviewed annually.

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Collaborative Governance

Others to engage: Community representatives, peak bodies.

Why it's important

The aim of the Heat Smart City Plan is to improve the lives and safety of people. Ground-truthing proposed programs with the communities they are designed to serve is essential for all types of hazards, but especially for the emerging issue of heat as there are few precedents in this country.

Over the coming five years, 'learning by doing' is likely to become common practice, and in such circumstances, integrating the community voice can maximise benefits, mitigate against unforeseen shortfalls, and modify actions in response to community lived experience.

Community members and leaders who are aware of and supportive of the Heat Smart City Plan will also be essential in supporting actions including data gathering, raising awareness about community safety, place-based pilots and more.

To ensure Heat Smart City Plan initiatives are delivering outcomes in a way that responds to the needs of communities of Greater Sydney, an ongoing Community Engagement Strategy should seek community feedback and insights to confirm the way Health Smart City Plan initiatives are delivered.

This should include but not be limited to:

- Establishment of a Community Advisory Committee to help shape and improve implementation of the Heat Smart City Plan. This includes:
  - Informing Taskforce decision making in policy, programs, service delivery, communication methods and engagement practices
  - Assisting the Taskforce to consult and respond to issues facing communities in Greater Sydney
- Providing an annual 'Report Back' on the Plan's overall delivery.

heatSMART decisions

Focus area: Benchmarking Heat

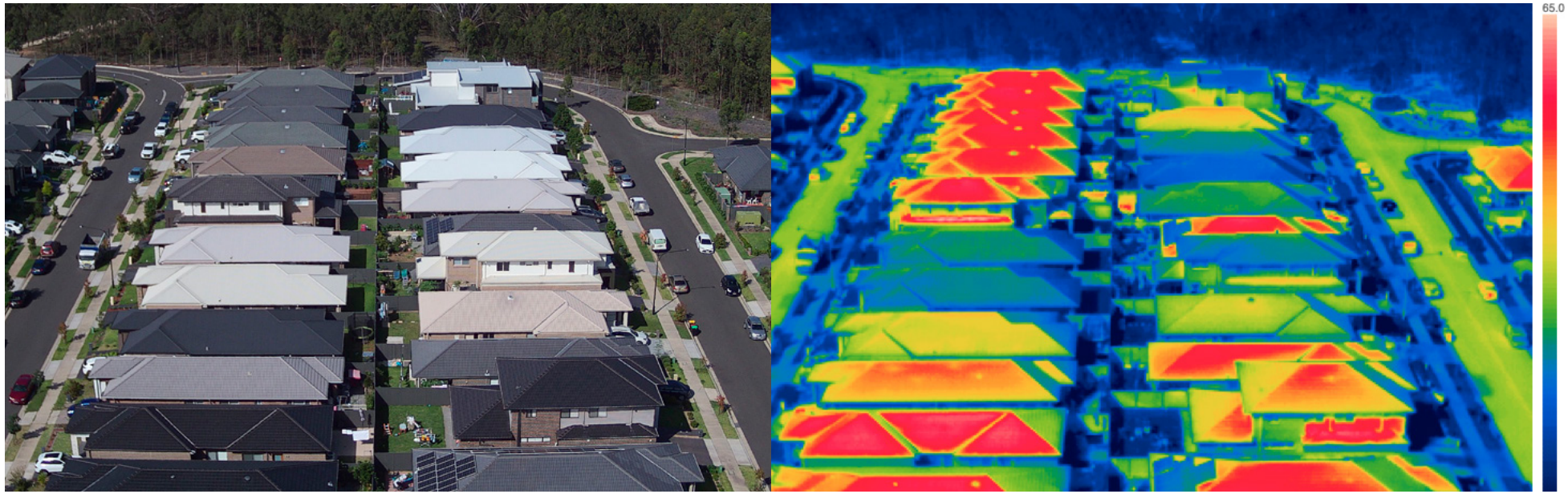
Shared understanding and monitoring of heat and heat risk improves action.

There are many ways to understand heat risks and impacts.

In this emerging field a range of definitions, data types and methods are currently being used to communicate, assess and evaluate heat risks and outcomes.

While different measures are likely required for different types of risks (e.g. human health, infrastructure and ecological communities), as a city we must understand and agree on which measures are appropriate for which applications.

This system-wide understanding is important for consistent data collection, risk assessment, impact measurement, as well as for clear communication about risk, impacts and outcomes to those across different sectors.



Normal and infrared aerial image showing temperature differences of roof materials and colours. Credit: S. Pfautsch, Western Sydney University.

RECOMMENDATION

4. Heat Risk Assessment

Adopt agreed heat risk assessment frameworks, incorporating emerging heat risk assessment models that support place-based decision-making.

Develop and make available a heat risk assessment framework and tool that supports place-based risk management decisions.

The Heat Risk Assessment must be based on agreed assumptions and align with federal and state government reporting requirements.

The framework should build on the Taskforce's Heat Risk Assessment, and include measures to assess the various forms of heat risk including:

- Community health risk
- Operational and built infrastructure
- Economic risks
- Future-focused planning risks.

Proposed Facilitator: NSW Reconstruction Authority
Taskforce Supporters: All Taskforce members
Timing: First pass Heat Risk Assessment framework and tool presented December 2025.
Status: Committed – seeking funding | ●●
Scale: Greater Sydney, with potential to scale statewide
SDMP link: Data
Others to engage: NSW Premier's Department, Bureau of Meteorology, NSW Common Planning Assumptions Group, Bradfield Development Authority

Why it's important

Understanding the nature, scale and contributors to heat risk is an essential precursor to develop effective mitigation and response measures and target resources effectively.

Heat risk assessment is an emerging issue at the federal, state and local levels. In 2024 there are a range of programs underway to understand and define heat risks, including:

- National Climate Risk Assessment
- NSW State Level Emergency Risk Assessment
- NSW DCCEEW – Climate Change Adaptation Strategy
- NSW Heat Vulnerability Index for Greater Sydney
- Greater Sydney Heat Taskforce Community Heat Risk Assessment Methodology

Each of these risk assessments operate at different spatial and temporal scales and assess different types of heat risk (e.g. long-term climate warming, extreme heat impacts on human health, local urban microclimates). It is important to ensure these frameworks align to ensure consistency, clarity, and effective linkages to governance and funding mechanisms. This will ensure outcomes are maximised.

A successful Heat Risk Assessment should:

- Be underpinned by a collaboration between different sectors and levels of government, such as infrastructure and health
- Be supported by a governance framework to ensure the risk assessment is updated regularly to account for changes in climate, exposure and vulnerability
- Include consistent data collection and management, ensuring agreed datasets are available and accessible to relevant stakeholders
- Be accompanied by ongoing training and capacity building
- Minimise barriers such as costs, resourcing or Intellectual Property.
- Consider the perceptions, beliefs, and priorities of communities through a bottom-up approach.[37]

HEATWAVE RISK ASSESSMENT

Understanding the nature, scale and contributors to heat risk is an essential precursor to developing effective place-based mitigation and adaptation strategies, emergency response planning, as well as targeting limited human and financial resources effectively.

While several federal, state and local risk assessments have been undertaken in recent years, each operates at different spatial and temporal scales, and assess different components of heat risk (e.g. long-term climate warming, extreme heat impacts on human health, or local urban microclimates). A key gap identified through the Taskforce process was the need for a risk assessment that focuses specifically on heatwave and guides local place-based decision making.

As part of the Greater Sydney Heat Taskforce program, a pilot project was undertaken to build a risk assessment method that puts heat on a similar footing as bushfire and floods; filling gaps in current approaches to assessing heatwave risk. Key characteristics of the method include:

Heatwave hazard: Many current risk assessment approaches focus foremost on climate change or urban heat rather than heatwave as defined in legislation and emergency management literature *"Three days of above average minimum and maximum temperatures"*. Focusing on heatwave allows users to link assessments back to governance pathways that can support action.

Probabilistic approach: Most hazards in Australia (e.g. flood and storms) take a probabilistic approach to risk assessment. A probabilistic approach to risk calculates Annual Exceedance Probability (AEP) for events of a certain magnitude. This approach (more commonly described as a one in 10, or one in 100-year event) is an essential starting point for calculating economic costs of heatwave and making the case for investment.

Links to human health: Most heat risk assessments show temperature in absolute terms (i.e. ambient temperature or land surface temperature) but have limited links to impacts on the human body. This project used the Universal Thermal Climate Index (UTCI) to represent heat hazard; a metric which has direct correlation to the level of stress placed on the human body. UTCI uses ambient temperature in combination with humidity, windspeed, and radiant heat (a combination of landcover, shading and building height) to understand conditions in place.

High granularity: For local organisations implementing place-based risk reduction strategies (i.e. urban design, community outreach or support services) high-level risk assessments at the suburb or local government level have limited use. For example, councils implementing tree planting programs must be able to prioritise particular streets within an LGA. This risk assessment delivered outputs at the highest possible granularity. SA1 for vulnerability assessment and 4m2 for heat hazard assessment.

Key findings from the pilot include:

- A strong need for this type of risk assessment at the local level for: emergency management, community engagement, urban and strategic planning, and environmental management.
- Quality, accessible, regularly updated data is essential for producing quality risk assessments that can be updated over time. There are currently gaps in data that need to be filled.
- The need to better understand the different elements of heatwave risk. Heatwave hazard impacts exposed elements in different ways. While the pilot focused on human impacts, other areas to explore include infrastructure, environments etc.

Next Steps:

At present, the Heatwave Risk Assessment is being piloted in three local government areas (LGAs), but is configured for application across Greater Sydney and NSW. Next steps for the project include:

- Testing the heatwave risk assessment methodology against empirical data to validate its findings.
- Expanding the pilot to additional LGAs to better understand different use cases.
- Refinement of the risk assessment interface to improve usability and accessibility for different parts of council and the community.
- Developing additional risk profiles for elements at-risk, including infrastructure.

Visualising the methodology on Heatwave Risk Assessment Dashboard.


HEATWAVE RISK ASSESSMENT DASHBOARD
WSREC
Heatwave Risk Drivers
BenQ

RECOMMENDATION

5. Triggers for Action

Develop a service impact model that articulates heat impact thresholds relating to community health, business and service continuity, and infrastructure operations.

The first step would be to investigate thresholds at which heat impacts escalate and what interventions are required. Thresholds should consider a range of heat hazard components including ambient temperature, humidity and windspeed. The impact model will be the basis for developing clear triggers for action that can be easily communicated and integrated into plans and policies. The model should be aligned with the current Australian warning system.

The impact model should consider, but not be limited to:

- When outdoor worker health is likely to be impacted
- When community health is likely to be impacted
- When mental health impacts and domestic violence rates increase
- When public transport network disruptions become likely
- When energy network infrastructure is likely to become impacted.

Proposed Facilitator: University of Sydney

Taskforce Supporters: Ausgrid, Australian Department of Climate Change, Energy, the Environment and Water, Endeavour Energy, local government, University of NSW, Western Sydney University, Transport for NSW, Bureau of Meteorology, NSW Health

Timing: First pass December 2026

Status: Scoping | ●

Scale: Greater Sydney, with potential to scale nationally

SDMP link: Warning Systems

Others to engage: NSW Premier's Department, National Emergency Management Agency

Why it's important

The Bureau of Meteorology established Australia's national heatwave forecasting system in 2014 and has provided a heatwave warning service since 2022.

The Bureau's service is generally available between October and March each year and provides heatwave forecasts for the next seven days. The forecasts differentiate between three levels of heatwave severity, based on maximum and minimum temperature forecasts, and a comparison to both long-term averages and recent conditions.

The Bureau's heatwave forecast is a valuable tool for its ability to provide a reliable, consistent and timely forecast of expected heatwave conditions. It also links to the Australian Warning System, with each warning level is linked to potential impacts and action statements relevant to the community.

However, as the impacts of heat become more chronic under climate change, and our heat management practices mature, practitioners increasingly require a more nuanced understanding of the ways in which heat impacts the city. This includes understanding features of heat hazard beyond temperature (e.g. humidity, wind and radiation), as well as thresholds at which different elements of the city become impacted (e.g. energy networks).

Work is needed to understand the likely impacts of heat events – of varying durations and levels of severity - on urban systems so that government, business, infrastructure operators, and service providers can also understand when and how to take action to minimise impacts.

CASE STUDY

LEARNING FROM INTERNATIONAL INITIATIVES

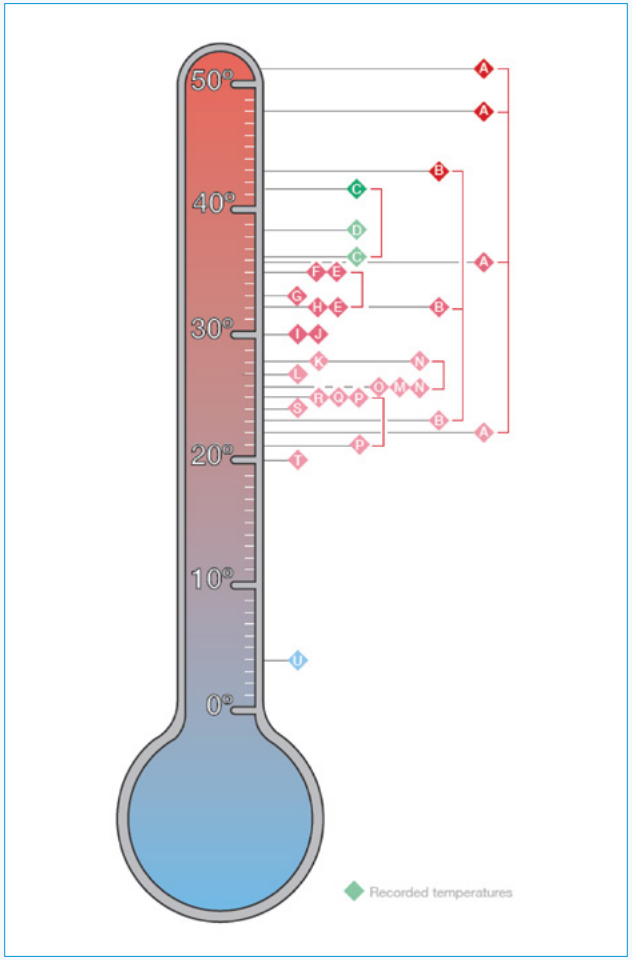
London's approach to understanding heat thresholds for city systems

The London Climate Ready Partnership (formerly London Climate Change Partnership) is a non-government organisation and centre for expertise on climate change adaptation and resilience to extreme weather in London.

To improve the understanding of the effects of heat on city systems, they completed a research project to examine the thresholds where city systems would be affected by heat, including electricity, transport and water supply systems[49]. This project found that individual system managers were managing heat-related risks and had identified thresholds where their own system would be affected by heat, however these thresholds were not well understood by others.

The report is a starting point to make these thresholds more visible, to shed light on the risks posed by heat. When heat causes impacts on city systems, the flow-on effects can be significant, and need to be understood by managers of other city systems, services and places, so they can manage risks which could impact on their operations. The LCCP report focuses on the social housing and care home sectors, as a case study for the specific issues which need to be considered.

The report highlights the need for further work to improve policy and practice relating to hot weather planning and heat risk management, including improved collaboration across sectors to manage system-wide risks.



The LCCP report identifies temperature thresholds ranging from 20-52°C, relevant to city systems including electricity, water, transport, and electronic equipment. (image sourced from LCCP Report)

London during summer.

RECOMMENDATION

6. Measure Heat Impacts

Develop and endorse agreed heat impact indicators to support consistent reporting.

Indicators should align with those outlined in the Federal and NSW Government's Heatwave Risk Assessments but also include additional metrics to reflect the full scope of impacts (e.g. both qualitative and quantitative measures):

- Economic impacts
- Productivity loss
- Health (e.g. emergency presentation of heat related illnesses and mental health
- Community wellbeing
- Environmental wellbeing
- Infrastructure resilience.

Proposed Facilitator: NSW Reconstruction Authority

Taskforce Supporters: Taskforce members

Timing: Draft Heat Smart Indicators delivered June 2025

Status: Scoping | ●

Scale: Greater Sydney, with potential to scale statewide

SDMP link: Data

Others to engage: National Emergency Management Authority

Why it's important

While heat is widely recognised as having major impacts on Greater Sydney's economy, infrastructure, environment and people, quantifying heat-related impacts remains challenging. There is a need to develop and endorse agreed heat impact indicators to support consistent data collection and reporting on the issue.

These indicators are critical for ensuring we:

- Understand the challenge: Our understanding of heat risk and impacts is still emerging. There is a need to understand the type of impacts that occur across the full continuum of heat-related events.
- Design effective interventions: There is no silver bullet for addressing heat risks. Understanding different types of impacts is a prerequisite for designing programs that work.
- Monitor success: In this new space, careful measurement of outcomes will be required to understand what works and what needs to be modified.

heatSMART

places for people

While we cannot prevent heatwaves, their severity can be exacerbated or mitigated by qualities of the built environment. Planning and building codes are critical levers for ensuring heat mitigation, adaptation and response policies are implemented proactively at the building, suburb and city scales.

Despite extreme temperature being Australia's most deadly natural hazard, building codes currently have no minimum standards for thermal safety, with air-conditioning inadvertently encouraged as the key adaptive response to heat. This is not a sustainable, equitable or resilient solution.

Beyond the individual dwelling, urban planning and design create significant opportunities for improving urban micro-climates, allowing communities to enjoy outdoor spaces throughout more of the year and spend less on energy bills. Urban planning and design can also support city resilience during extreme events through safe transport, public refuges, resilient infrastructure and protection of ecological communities.

This direction seeks to promote places that support climate mitigation, adaptation and heatwave emergency response. This includes improving regulation, supporting industry change and empowering communities to make change where they can.

heatSMART
places
for people

Focus area:
Heat Safe Homes and Buildings

New and existing homes, buildings and places minimise energy, emissions and can keep people safe from heat.

Shelter is a basic human right. A well-designed home is about more than just comfort, it can reduce energy bills, deliver better health outcomes, and support life safety in extreme events.

The following recommendations seek to ensure all people have access to climate resilient homes and buildings. The recommendations seek to support owners, renters and renovators.

A diverse range of approaches will be needed to deliver Heat Safe Homes and Buildings including regulatory change, guidance, incentive programs, and education.

Children playing board games indoors on a hot day.

RECOMMENDATION

7. Heat Safe Social Housing

Retrofit social housing properties to improve thermal performance and minimise heat stress.

Implement a retrofit program to improve thermal performance to minimise heat stress in social housing, prioritising locations and clients with high stress heat risk.

Proposed Facilitator: Homes NSW

Taskforce Supporters: Local government, Department of Communities and Justice

Timing: 2025 onwards

Status: Implementation | ●●●●

Scale: NSW

SDMP link: Home Modification

Others to engage: Community housing providers, community organisations, universities, local health districts

Why it's important

Social housing households have low incomes, spend disproportionately more of their income on energy, and are at higher risk of experiencing financial stress.

As the average age of social housing dwellings in NSW is over 40 years, homes can be cold in winter and hot in summer. The Australian Institute of Health and Welfare National Social Housing Survey (2018) found that after safety/security of home (97%), thermal comfort (96%) was the next most important amenity for social housing tenants.

Concerns about energy costs can lead to households going without heating or cooling, or forego food or medication, putting their health and lives at risk.

Improving the design and performance of social housing is important as it:

- Improves health and wellbeing
- Reduces utility bills
- Reduces carbon emissions
- Creates employment opportunities
- Improves social equity.

RECOMMENDATION

8. Heat Safe Rentals

Set and enforce thermal performance standards for residential rental accommodation, including retrofit incentives targeting areas of greatest risk.

As a first step, this initiative should explore:

- What minimum standards should be
- Review appropriate reform pathways (e.g. Residential Tenancies Act 2010)
- Outline proposals for enforcement
- Consider funding and delivery mechanisms for home retrofits

Proposed Facilitator: University of NSW, Western Sydney University

Taskforce Supporters: Sweltering Cities

Timing: 2025–2030

Status: Scoping | ●

Scale: NSW

SDMP link: Home Modification

Others to engage: Tennant representative bodies, banks, NSW Rental Commissioner

Why it's important

Many people most at risk of heat related illness or death are renting in private or social housing. Rental tenants are more likely to live in low energy efficiency homes, have limited abilities to make alterations, and may have less capacity to pay for energy bills and other services to keep themselves safe.

Research has found that that because of inefficient appliances and a lack of weatherproofing, renters pay an average of 8% more in energy bills than homeowners in like-for-like homes, and indoor temperatures regularly exceed well beyond minimum World Health Organisation standards for healthy homes.

Measures such as insulation, window coverings, sealing doors and windows and providing decent heating and cooling systems are critical to lower energy bills and improve the occupant's health and wellbeing.

The principle of no-one left behind was considered critical by the Taskforce. This initiative proposes to develop evidence-based recommendations for enforceable, minimum thermal standards for rental accommodation, supported by a program of retrofit incentives targeting areas of greatest risk.

Listening to communities

"Renting is tough for a lot of reasons - one of the reasons is not having the autonomy to make structural changes that could make our housing safer and more liveable in extreme heat, or make our cooling costs cheaper."

– Elise, Western Sydney resident[25]

RECOMMENDATION

9. Heat Safe Builds

Inform thermal safety requirements within the National Construction Code to ensure new buildings protect occupants from extreme temperature.

Implement an advocacy program to ensure updates to the National Construction Code (NCC) include:

- A minimum thermal safety standard for new buildings (e.g. homes and community buildings)
- Testing new home performance in free-run mode (to test thermal performance without power)
- Modelling the performance of new residential buildings against future climates to ensure maintained safety over time
- Ensure climate zones and climate projections are regularly (every 5 years) reviewed and revised where required.
- Ensure tools such as NatHERS use updated climate data

Proposed Facilitator: Western Sydney University, University of NSW

Taskforce Supporters: Australian Red Cross, Green Building Council of Australia, local government, NSW Reconstruction Authority, NSW Department of Planning Housing and Infrastructure, University of Sydney, WSROC

Timing: 2025–2028

Status: Scoping | ●

Scale: National

SDMP link: Building Codes and Standards

Others to engage: Building Codes Board, Liveable Housing Australia, Bradfield Development Authority, CSIRO, National Emergency Management Agency (NEMA), NSW Health

Why it's important

In Australia, the right to safe housing is enacted through the National Construction Code (NCC). The NCC enables nationally consistent, minimum standards of relevant safety, health, amenity and sustainability objectives. Despite extreme temperature being Australia's most deadly natural hazard, the NCC currently has no minimum standards for thermal safety.

While thermal performance is included in the NCC, it is a measure of energy efficiency rather than human thermal safety. Thermal safety refers to the ability of a building to maintain an acceptable internal temperature in a wide range of conditions - including when power outages occur and during heatwaves. This is a feature of building codes in other countries, for example, the UK's CIBSE TM 59 defines an upper comfort limit, which increases with average outdoor temperature, and requires that indoor temperatures stay below that limit, without assistance from air-conditioning, for all but 3% of occupied hours. Note that the terms 'thermal autonomy' and 'passive survivability' are also used to describe this critical aspect of thermal performance.

Recent research[41] has shown that currently compliant homes do not provide safe, comfortable living environments during hot weather, particularly when access to cooling is disrupted. In addition to the absence of thermal safety standards, recent research[41] shows that current Australian housing codes are based on historical climate data, which means homes build today are not fit for our current climate, let alone future climate conditions.

RECOMMENDATION

10. Heat Smart Home Improvements

Deliver a community education campaign to improve household knowledge and confidence in making cool choices for their home and garden.

Develop a community education campaign, built on existing evidence-based guidance (see Cool Design and Cool Suburbs recommendation) and presented in an accessible way that applies to different use cases (e.g. options for renters, owners conducting small upgrades, or larger renovations, and support selection choices for new builds). The campaign will clearly outline practical considerations for residents and builders when embarking on home improvements.

A suite of education materials will need to be developed to cater to diverse audience. Education tools will likely include, but are not limited to; heat smart packages for developers, homeowner design guidance, DIY self-help workshops and videos.

Proposed Facilitator: Western Sydney Regional Organisation of Councils

Taskforce Supporters: Homes NSW, local government, NSW Department of Planning, Housing and Infrastructure, NSW Reconstruction Authority Sweltering Cities, University of NSW, University of Sydney, Western Sydney University

Timing: December 2026–2030

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Home Modification, Community Awareness and Preparedness.

Others to engage: Builders, developers, hardware retailers

Why it's important

Approximately 94% of Greater Sydney's 2027 housing stock is already built. As such, the thermal performance and climate resilience of most housing stock is most likely to be improved through ongoing design upgrades over time.

Despite the known challenges of a warming climate, heat resilient design is a relatively new issue. There is a need to build community awareness of heat resilient design strategies so that people can make well-informed decisions when looking to upgrade their home.

The next five years to 2030, is a key window for supporting resilient home design decisions. A large proportion of Greater Sydney homes were built in the post-war boom (1950s – 1970s) and are currently due for a range of material upgrades (e.g. roofing refurbishment or replacement).

In addition, recent research of design choices during Western Sydney project builds suggests many households are not aware of design measures that could improve thermal comfort and reduce cost-of-living associated with energy bills.

Listening to communities

"It was the thousand dollar power bill. That was the reason. I ended up putting in insulation above the garage, because the garage got so hot. We've put block out blinds instead of sheers to stop the sun. And we've put an electric awning out the back, just because the sun on the house heats up but... It's a killer."

– John, 38, Riverstone

heatSMART
places
for people

Focus area:
Heat Smart Planning

Integrated heat mitigation and adaptation is required in state and local planning controls.

While we cannot prevent extreme heat and heatwaves, their severity can be exacerbated or mitigated by qualities of the built environment.

Simple design choices relating to orientation, shading, cool materials, use of greening, water and permeable surfaces can significantly impact local micro-climates, improving comfort and reducing the need for energy – allowing communities to thrive in a warming climate and hotter weather[52].

A resilience approach to planning involves not only reducing urban heat, but minimising emissions and helping people adapt to a hotter climate..

Smart urban planning and design can also support communities, businesses and the environment survive extreme events – by ensuring water, shelter and electricity are available when they're needed most.

Shaded play area provides thermal comfort for community members.

RECOMMENDATION

11. Cool Design Guidance

Develop, publish and promote guidance for government, industry and community to mitigate heat through planning and design.

Develop and improve access to guidance for government, industry and community on how planning and design interventions can mitigate and support adaptation to urban heat.

As part of this, raise awareness about how cooler places can be created by using:

- greening and canopy cover
- water
- urban structure, and
- cool materials.

Proposed Facilitator: NSW Department of Planning, Housing and Infrastructure, Western Sydney Regional Organisation of Councils, NSW Reconstruction Authority

Taskforce Supporters: Local government, Sydney Water

Timing: 2025 onwards

Status: Committed – delivery planning | ● ● ●

Scale: Greater Sydney

SDMP link: Nature Based Measures, Strategic Planning Controls, Mitigation Infrastructure

Others to engage: Bradfield Development Authority, universities

Why it's important

Urban design and planning have a central role to play in building heat resilience. However, cool urban planning design is a relatively new area.

Engagement with industry and government has found a desire for clearer information on how planning and design interventions can mitigate and support adaptation to urban heat. The Cool Design guidance should provide formal guidance and advice regarding urban and building design, as well as how greening, water, urban structure and cool materials can be used to create cooler places.

This guidance will play a central role in the development of planning controls, developer guidelines, public space delivery and master planning moving forward.

Mature tree canopy provides shade at local sports field.

RECOMMENDATION

12. Cool Suburbs Assessment

Deliver a rating and assessment tool to support industry and government deliver cool homes and suburbs in line with the latest science.

Develop and deliver Cool Suburbs NSW to support best practice innovation in heat resilient design. Use the Cool Suburbs NSW rating tool to benchmark developments and test a range of new design approaches.

Ensure ongoing investment for ongoing maintenance and future updates to Cool Suburbs.

Proposed Facilitator: Western Sydney Regional Organisation of Councils
NSW Reconstruction Authority

Taskforce Supporters: Local government, Sydney Water, Green Building Council of Australia

Timing: 2024 onwards

Status: Committed – seeking funding | ● ●

Scale: NSW, with the potential to scale up nationally

SDMP link: Nature Based Measures, Strategic Planning Controls, Mitigation Infrastructure

Others to engage: Bradfield Development Authority

Why it's important

Cool Suburbs NSW is an evidence-based resilience rating and assessment tool for urban development across all NSW climate zones (WSROC). Cool Suburbs NSW is a clear first step towards building industry's capacity to deliver homes and suburbs for our changing climate as it as provides clear, evidence-based guidance which builds capacity and allows users to test new and innovative approaches.

The development of Cool Suburbs NSW has been co-designed with industry and government stakeholders. The guidance is evidence-based and developed in consultation with a science panel (Western Sydney University, University of NSW, UNSW, Monash University, Melbourne University).

To date, Cool Suburbs has been used (amongst others) to inform several master planned communities, councils' DCP clauses and Green Building Council's Green Star Communities v2 (heat resilience credit).

Cool Suburbs was released September 2024 (coolsuburbs.au). This recommendation seeks to identify ongoing funding and resourcing for future development, maintenance and dissemination of the tool.

Cool Suburbs is considered an important tool in promoting and celebrating new and innovative design solutions by the private and public sector.

From the frontline

"Households rely on us to give them the information. Because they're not going to look into it. Unless you're in the building industry. It's all about the look. This is why I think the BASIX thing is going to be very important because it's going to add a lot more features to the home than previously. So they won't have to think as much. They know that they'll have to pay a little bit more. But they won't have to think as much."

– Mary, Builder sales consultant

Timber frame for new home.

ADDRESSING HEAT-RELATED RISKS IN THE PLANNING SYSTEM

Between 2001–2018 more than half of heat-related deaths occurred within or near (mostly residential) buildings. In addition, research shows that key urban infrastructure is vulnerable to heat including energy networks, transport systems, mains water and telecommunications systems[1].

Despite heat being a significant and growing hazard in urban areas, there are currently limited mandated requirements for addressing urban heat in the NSW planning framework, except in a small number of Local Environment Plans (LEPs) and Development Control Plans (DCPs). BASIX includes recently updated thermal performance standards which promote comfort inside residences in the context of current climate zones and support the reduction of waste heat from mechanical cooling. However, this only addresses one small aspect of planning and design to mitigate the impacts of heat.

To consistently achieve better outcomes in planning and design, heat smart principles and measures need to be integrated systematically into the planning system. Measures should address:

- **All parts of the built environment:** There are many ways to reduce heat-related risks in urban development – e.g. in the design of buildings, public places, integration of living infrastructure and water into the landscape – see figure 6 on following page. Heat smart design needs a systematic approach across all these elements as the measures illustrated in the figure on page 77 work together and their benefits accumulate to achieve effective cooling outcomes.
- **All levels of planning and design:** Built outcomes depend on many decisions, made by different people at different stages of the development process – the figure on page 78 illustrates where heat could be addressed at many levels in the planning system. Decisions in the earlier, higher-level stages of planning and development (e.g. at rezoning stage) can reduce the burden down the line (e.g. for individual home builders). With many decisions to weigh up at all stages of the development, clear rules and measures that are relevant to local climatic conditions are crucial.
- **All planning pathways:** There are many different approval pathways for new development, via local and state-level instruments. For example, a significant and growing proportion of development utilises the exempt and complying development pathways in the Codes SEPP, bypassing local development controls. Heat smart design needs to be integrated into all approval pathways to achieve consistent outcomes.
- **All stages of the planning, design and approvals process:** Built outcomes are designed to meet the intent of planning provisions and comply with design requirements.

Some heat reducing measures may add costs up front in the development process. However there are already measures which are cost neutral (e.g. lighter coloured roofs), and measures that are likely to become cheaper if their use becomes more common and the market matures (e.g. improved glazing). Cost savings can be made when heat smart design is embedded early: it reduces residual cooling and heating costs passed on to residents and businesses, as well as reducing health costs and improving workplace productivity. Design choices can be complex for consumers, and the planning system could provide stronger requirements, incentives and guidance to help consumers select measures which will pay off over the lifetime of their build.

Planning and design measures for urban heat resilience

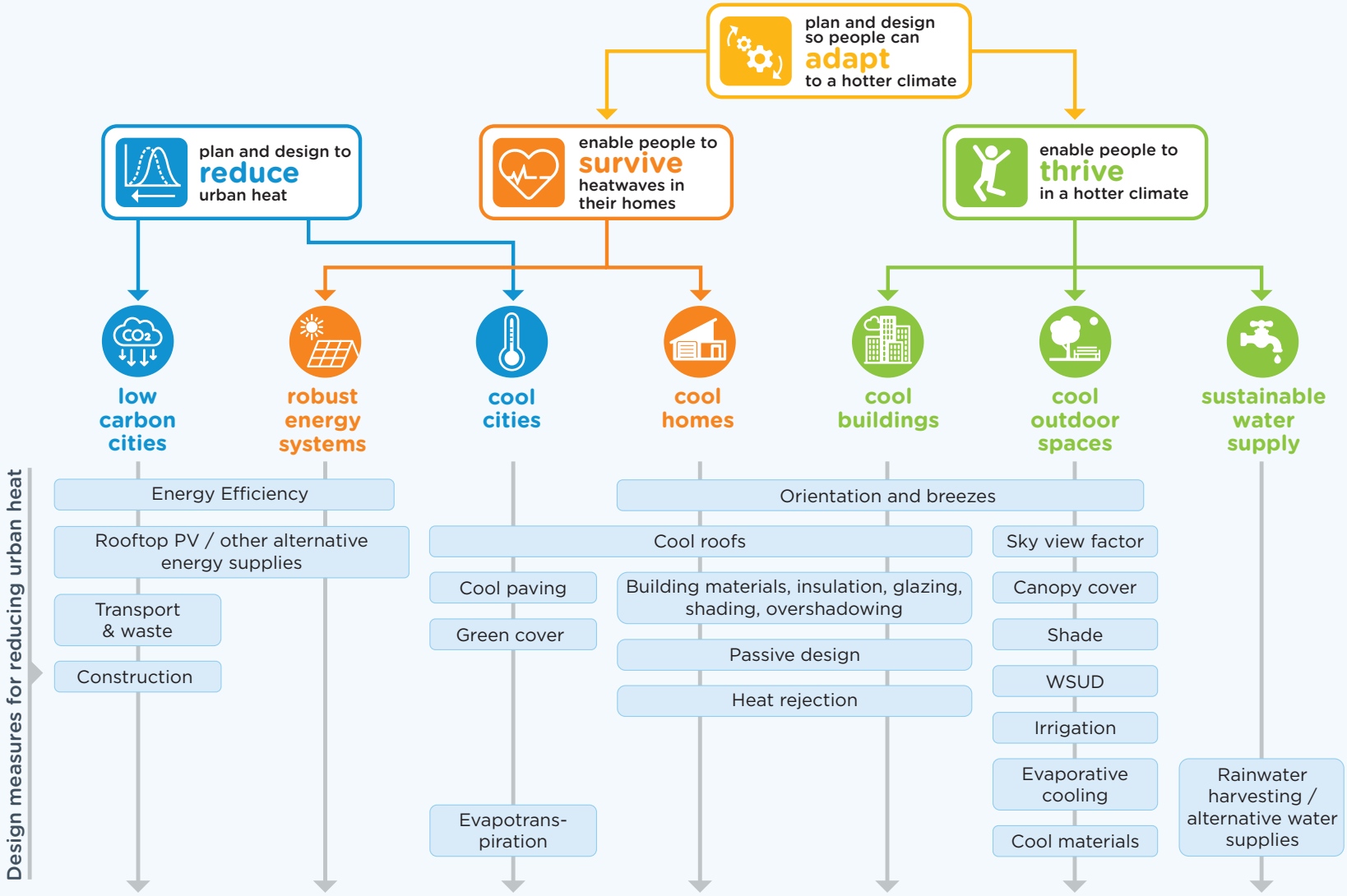


Figure 6 identifies several ways that urban planning and design can address urban heat. Building resilience is cumulative, so a combination of measures that reduce urban heat and support adaptation are needed to help people to survive heatwaves and thrive in a warmer climate.

Recommended changes to the NSW planning system

Considered planning and urban design controls are a critical lever for creating cooler, healthier, more liveable urban environments in the face of a changing climate. Figure 7 outlines recommended changes to the NSW planning system that would support heat resilience. These recommendations were prepared in consultation with councils in Greater Sydney.

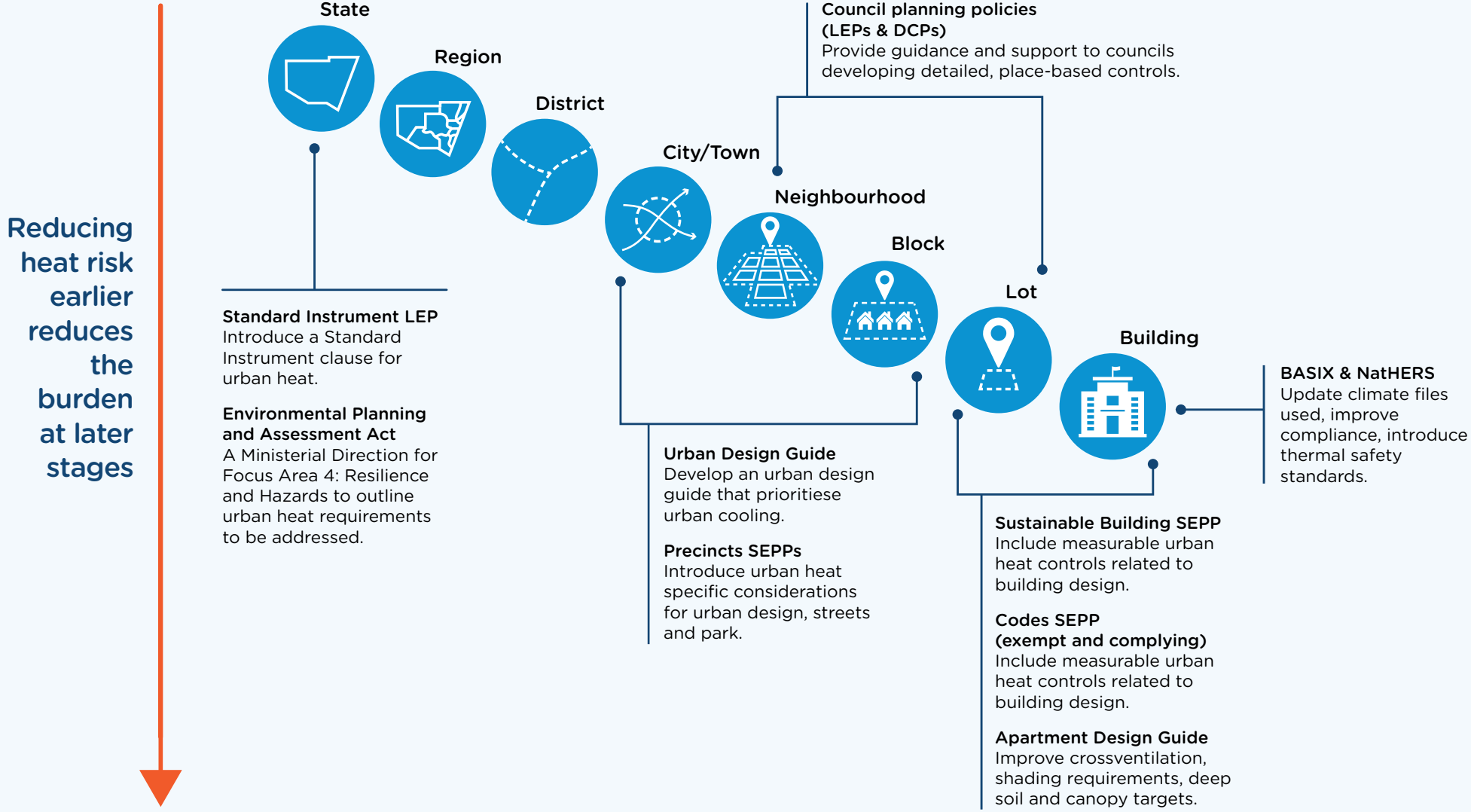


Figure 7: Proposed changes to the NSW Planning System (image modified from Draft Urban Design Guide).

Water sensitive urban design at Blacktown Showground precinct

RECOMMENDATION

13. Cool Planning

Review the NSW Planning System to identify where heat risk mitigation and adaptation measures need to be adopted into strategic state and local planning controls and land-use overlays.

Adopt appropriate heat risk mitigation and adaptation measures into relevant state and local strategic planning controls while allowing local authorities to respond to local risk and community needs.

Taskforce stakeholders specifically recommend the need to:

- Work with relevant stakeholders to identify required updates to: Sustainable Buildings SEPP, Codes SEPP, Precincts SEPPs, Standard Instrument LEP, local LEPs and DCPs
- Develop heat risk mapping overlays to inform strategic planning and application of controls, using up to date applicable climate data / climate zones
- Provide guidance and support to improve clarity, consistency and justification for changes. Including planning circulars, case studies, background information, urban heat and vulnerability mapping, as well as strengthening compliance support..

Proposed Facilitator: Department of Planning, Housing and Infrastructure Local Government, NSW Reconstruction Authority

Taskforce Supporters: Western Sydney Regional Organisation of Councils

Timing: 2024–2028

Status: Scoping | ●

Scale: Greater Sydney, with potential to scale statewide

SDMP link: Strategic Planning Controls

Others to engage: Bradfield Development Authority, development industry, universities

Why it's important

Heat kills more Australians that fire, floods and storms combined[1]. While we cannot prevent heatwaves, their severity can be exacerbated or mitigated by qualities of the built environment. The planning system is a critical lever to ensure heat mitigation and adaptation policies are implemented proactively.

Research shows that failing to implement proactive strategies now, will lead to reactive policies (e.g. retrofits) which are estimated to cost 3-4 times more, without properly solving the problem.

The need for updates within the current planning framework was identified as a critical need as part of the Taskforce process, which engaged with leading researchers, industry experts, community and policy makers.

Strategic and landuse planning is a shared responsibility, with different consent authorities as well as a broad group of other actors. As such, implementation of this recommendation should be a collaborative approach.

From the frontline

"Embedding minimum heat resilience standards across the planning system is critical. We currently rely on a few weak DCP controls. While a small number of good developments are designed to be heat resilient, they are few and far between. If we want to see heat resilience consistently delivered, we need to create a strong regulatory framework that applies to all development. If we don't, our communities will ultimately foot the bill through increased energy costs and poor health."

– Jesse McNicoll, Strategic Planning and Urban Design, City of Sydney

economies

Heat is already imposing significant costs to Sydney's economy. Leaders across government and the private sector must understand the economic impacts of heat so they can successfully mitigate risks to operations, customers in the community, and adapt accordingly. As the frequency and severity of heat events increase, there is also need to assist businesses and organisations (including private sector, government and non-for-profit) prepare to prevent losses and ensure safety of staff and clients.

Mitigating and adapting to heat is a relatively new issue in Sydney's economic landscape. This direction includes a strong focus on awareness and measurement as organisations build their skills, frameworks and risk management process over the next five years to 2030.

While much work is needed to mitigate and adapt to heat, our changing climate also creates opportunities for innovation. Taskforce stakeholders encourage Sydney businesses and governments to harness world leading opportunities for new product development, job creation and skills building.

heatSMART economies

Focus area:
Heat Smart Marketplace

The private sector supports heat risk reduction, minimises the economic impacts of heat and seeks commercial opportunities in adaptation.

Heatwaves are already imposing significant cost to the Sydney economy through reductions in worker productivity, business interruption, product spoilage and changes to consumer spending habits. These impacts are set to increase in our warming climate. However, we can't manage what we don't measure.

The Heat Smart Marketplace focus area seeks not only to improve how we measure and manage the economic impacts of heat. But also seeks to encourage innovation; harnessing opportunities for new skills, products and services to meet the demands of our changing climate.

People shopping in Liverpool Mall

RECOMMENDATION

14. Intergenerational Report

Publish impacts and economic costs of heatwaves in 2028 NSW Intergenerational Report (aggregate risk), and biennial departmental climate change impacts, risks and adaptation statements (enterprise risk disclosure) to inform the NSW budget and policy development.

This should include consideration of both direct and indirect costs to specific industries, government, and the community. Ensuring the costs of heat are embedded in NSW government reporting frameworks will establish clear baselines and drive informed long-term investment in heat mitigation and adaptation efforts.

Proposed Facilitator: NSW Treasury

Taskforce Supporters: Committee for Sydney, NSW Department of Climate Change, Energy, the Environment and Water, NSW Department of Planning, Housing and Infrastructure, NSW Reconstruction Authority, University of NSW, University of Sydney, Western Sydney University

Timing: Next Intergenerational Report due 2028

Status: Scoping | ●

Scale: NSW

SDMP link: Data, Monitoring and Reporting

Others to engage: NSW Health, Private sector

Why it's important

Heat is already imposing significant cost to the Sydney economy. According to the Burning Money report from the Committee for Sydney, the annual costs of heatwaves are estimated to be $1.4 billion for Western Sydney alone.

The burden of these costs will not fall equally across Sydney, and will be borne by households, businesses and government alike.

Heat risk is currently missing from the Intergenerational Reporting Framework. However, as the economic costs from heatwave and other climate risks become more defined, there is an opportunity to bring the growing costs to business and households into NSW Treasury reporting frameworks to highlight the case for investment in adaptation.

Costs of heat include, but are not limited to, impacts on biodiversity, business, tourism, trade, productivity, healthcare expenditure, infrastructure, service disruptions, crime and violence, utilities data.

RECOMMENDATION

15. Burning Money Brief

Build awareness among key public and private sector decision makers in NSW regarding the economic impacts of heat and priority recommendations for action.

This should include ongoing briefings and engagement with key decision makers to build awareness to ensure policy and legislation is informed by an understanding of heat risk and appropriate mitigation measures.

Proposed Facilitator: Committee for Sydney

Taskforce Supporters: Business Western Sydney, Resilient Sydney, Western Sydney Regional Organisation of Councils

Timing: 2025–2030 ongoing

Status: Implementation | ●●●●

Scale: Greater Sydney

SDMP link: Data, Capacity and Capability

Others to engage: Private sector

Why it's important

Heat impacts many sectors in both direct and indirect ways. It is important that decision makers across government and the private sector understand economic impacts of heat, so they can successfully mitigate risks to operations, customers and the community, and adapt accordingly.

While heat is widely recognised as having major impacts on the city, its systems and people, quantifying heat-related impacts remains challenging. In 2021, NSW Treasury identified the need to better quantify heat-related impacts on both health and infrastructure in NSW.

The Committee for Sydney's Burning Money report (2024) quantifies economic impacts of heat on energy, productivity and health costs.

The report focused on Western Sydney and found that over the next 50 years, heatwaves will drive an increase in economic, social and health costs to Western Sydney by more than 400%.

Decisions made today about how and where to build new homes, businesses and infrastructure need to recognise and attempt to alleviate those growing costs tomorrow.

Understanding where, to whom and how these impacts will play out is critical to informing policy, as is learning how to stop perpetuating risks moving forward.

RECOMMENDATION

16. Sovereign Heat Risk

Engage with the Australian Government regarding recognition of heat as a peril through pre (Treasury and Planning) and post event (Disaster Management) channels.

This work should inform budget planning, resilience building and optimised management of climate-related perils in Australia.

Proposed Facilitator: To be determined

Taskforce Supporters: Swiss Re

Timing: 2025 onwards

Status: Scoping | ●

Scale: National

SDMP link: Capacity and Capability, Insurance

Others to engage: Insurance sector, including: Insurance Council of Australia, Council of Australian Life Insurers

Why it's important

The Australian Government's National Climate Risk Assessment First Pass report identified growing concern regarding climate change and extreme temperatures on Australia's future. This includes impacts to govt services, communities, and household affordability as well as economy, trade and finance systems. The Assessment identifies the risk of shifts in investment away from areas that are vulnerable to the physical impacts of climate change; decreasing financial stability and capacity to invest.

At present there is limited understanding of Australia's sovereign risk relating to extreme heat. Building this understanding will strengthen government capacity and the business case to implement effective risk mitigation and adaptation to help manage household affordability and enable effective emergency response while protecting its fiscal balance.

The strategic direction the Australian Government sets is critical to Greater Sydney's heat resilience. Federal directions have trickle-down implications for state and local policy. There are also direct financial implications. For example, heatwave is not currently a designated disaster under federal Disaster Recovery Funding Arrangements, limiting the types of financial assistance available to governments and communities following an unprecedented heatwave event causing widespread infrastructure failure and increased human service demand for the city's 5.5 million residents.

RECOMMENDATION

17. Heat Smart Insurance

Raise awareness of growing heat-driven risk exposure and application of appropriate insurance solutions to build social and economic resilience.

Increase awareness of heat risk, and appropriate insurance solutions. Ensure that appropriate insurance solutions are accessible, provide equitable coverage, while remaining affordable.

Proposed Facilitator: Swiss Re

Taskforce Supporters: Business Western Sydney, Committee for Sydney, NSW Reconstruction Authority

Timing: 2025–2030

Status: Scoping | ●

Scale: Greater Sydney, potential to scale nationally

SDMP link: Insurance, Capacity and Capability

Others to engage: Insurance industry (incl. Insurance Council of Australia, Council of Australian Life Insurers), infrastructure sector

Why it's important

Increasing temperatures and heatwaves are increasing exposure for many businesses and communities, creating risk of underinsurance and enlarging the protection gap.

The growing financial impact of heatwaves on households and businesses can also lead to increased economic losses and affordability issues.

With increasing exposure, a range of insurance covers may be directly or indirectly affected by the growing heat risk, requiring businesses and households to consider potential changes / increases in cover. Such covers include but are not limited to:

- Property (damage, business interruption, machinery breakdown)
- Liability (employer liability, workers compensation)
- Life and health (medical, disability, mortality)

The National Climate Risk Assessment has raised concern about increased risk to insurance, including re-insurance risk due to international disasters. Costs will escalate to unaffordable levels in some areas, while asset values may suffer large decreases. There is also a risk of underinsurance. As a more 'silent' peril, extreme heat is likely to further exacerbate the economic and social pressures already felt by increasing flooding and cyclone events.

CASE STUDY

INNOVATIVE HEAT INSURANCE HELPS WOMEN IN INDIA

In 2024, an innovative new heat insurance initiative[42] was triggered for the first time in India. ***The Women's Climate Shock and Insurance and Livelihoods Initiative (WCS)*** provides a package of income support, early warning systems, and heat-safety guidance to women working in the informal sector; supporting them to keep themselves and their families safer on extreme heat days.

Participants of the WCS work as street vendors, waste recyclers, ship breakers, farmers, salt miners and other self-employed, heat-exposed jobs, earning an average of three dollars per day. Women informal workers are disproportionately harmed by climate impacts – many of them work outdoors and in dangerously hot indoor conditions and report year-round rashes, miscarriages, urinary tract infections, dizziness, crop losses, melted merchandise, loss of income, and more.

How it works:

The Women's Climate Shock and Insurance and Livelihoods Initiative (WCS) is a collaboration between Climate Resilience for All,[43] the Self-Employed Women's Association (SEWA), and Swiss Re Public Sector Solutions.

This unique initiative combines layers of protection:

- It has parametric insurance covering extreme heat days, providing income support directly to the individual when there are harmful heat waves.
- Further, the program is piloting an early warning system and corresponding targeted actionable guidance for specific communities and geographies.
- Lastly, the program is bringing new participants into the financial system with bank accounts so they can receive the money quickly and directly.

'Parametric' (or index-based) insurance operates differently to traditional indemnity insurance. CRA, SEWA and Swiss Re worked together to determine a temperature threshold at which financial losses typically occur for that segment. Once triggered, policyholders automatically receive a pre-determined payout, reflecting the number of days wages lost.

Extreme heat temperatures triggered the insurance and cash payments in the states of Rajasthan and Gujarat and 22 districts. Ninety-two percent of the 50,000 women enrolled in the program received insurance payments.

Swiss Re's technical expertise was behind the design and structuring of this innovative parametric microinsurance solution. With a scalable model for sustaining income due to climate impacts performing; the approach suggests that governments and companies across the world could build climate, health, and economic resilience for societies across the world by adopting it.

As our climate warms, innovative products like this will become increasingly important for managing the financial impacts of extreme heat and building resilience of at-risk communities.

Indian woman getting water from the well.

RECOMMENDATION

18. Heat Smart Innovations

Identify, test and roll out new solutions to address heat risk with a focus on skills building, new technology, product development.

Advocate for the establishment of an innovation fund to support development, testing and application of new products and services that reduce heat risk and support city resilience. Priority should be given to innovations that meet a clearly articulated need and can demonstrate opportunities for wider roll-out.

Proposed Facilitator: Business Western Sydney and Committee for Sydney

Taskforce Supporters: Taskforce members

Timing: 2025–2030

Status: Scoping | ●

Scale: Greater Sydney

SDMP link: Capacity and Capability

Others to engage: Department of Industry, Innovation and Science Australia, Public Sector Network, Investment NSW, Private sector

Why it's important

Mitigating and adapting to heat is a relatively new issue in Sydney. Creating opportunities for innovation will assist with the development of new products, services and skills that support a heat resilient city – including opportunities for replication and export.

Heat Smart innovations are needed right across the economy to help mitigate and adapt to our changing climate. Examples may include:

- Cool coatings to reduce heat absorption of roads and rooftops
- Expanded operational thresholds for key equipment including air-conditioners, medical devices and more
- New insurance products
- Social connection programs.

Proactively seeking innovation opportunities will help reduce opportunity cost as well as catalysing the creation of jobs and speciality skills.

Workers applying ‘cool’ reflective coating to local road pavement. Credit: City of Parramatta.

heatSMART economies

Focus area:
Heat Smart Work

Capacity building for effective heat risk management by business and industry.

Climate change, including more frequent and severe heatwaves, is set to change the way we do business.

There is a need to ensure workplaces are prepared to manage the impacts of heat on their workforce, customers and operations. This includes building out a range of measures from the content of training and first aid courses, to infrastructure specifications.

Man working on laptop in central business district.

RECOMMENDATION

19. Heat Safe Workplaces

Build capacity of organisations, business and industry stakeholders to plan, prepare for and respond to heat risks. Including integration of heat risk as part of business as usual operations, business continuity, Duty of Care and WHS in all policies.

Deliver a collaborative program of activities to support organisations, business and industry to plan, prepare for and respond to heat risks, including:

- An annual business and industry forum focusing on heat safe workplaces, to support industry stakeholders to plan, prepare for and respond to heat risks
- Demonstration of best practice from a cross-section of organisations and business (universities, utilities, government, construction and manufacturing). (also, ref Recommendation 20)
- Small business engagement program
- Improved heat risk assessment tools for assessing heat-related risks in workplaces.

Proposed Facilitator: Business Western Sydney, Local Government

Taskforce Supporters: Business Western Sydney, Local Government, University of Sydney, Western Sydney University, Department of Communities and Justice, Committee for Sydney

Timing: 2025–2030

Status: Scoping | ●

Scale: Greater Sydney

SDMP link: Capacity and Capability, Community Awareness and Preparedness

Others to engage: Small Business Commissioner, Utility providers

Why it's important

Businesses can be significantly impacted by heatwave events, especially if such events coincide with power outages. However, heatwave is often not as embedded in BAU risk management protocols like other hazards. As the frequency and severity of heat events increase, there is a need to assist businesses (including private sector, government and not-for-profit) prepare to prevent losses and ensure safety of staff and clients.

Impacts to businesses include, but are not limited to:

- Lost productivity (due to forced work stoppage or slowdown in operations)
- Increased repair / operational costs (due to failure of heat sensitive equipment, requirements for colling systems)
- Potential legal and workers compensation costs (due to negligence and safety failures)

Likewise, businesses that actively manage heat related risks can benefit from more economic stability, along with greater staff productivity and engagement.

RECOMMENDATION

20. Heat Safety Workplace Pilot

Develop a Heat Safety Strategy for staff and students working on Western Sydney University campuses

A comprehensive approach to heat safety which will combine communications, policy, physical infrastructure and heat and humidity sensor monitoring. Results from this work will be shared as part of the Heat Safe Workplaces recommendation (recommendation 19). This will form a case study which can be shared with others.

Proposed Facilitator: Western Sydney University

Taskforce Supporters: Western Sydney University, Business Western Sydney, University of Sydney, local government, utilities, Department of Communities and Justice

Timing: 2025

Status: Committed – delivery planning | ●●●

Scale: Greater Sydney

SDMP link: Capacity and Capability, Community Awareness and Preparedness

Others to engage: Western Sydney University partners, Local Health Districts, Bureau of Meteorology

Why it's important

Western Sydney University employs around 4,500 staff and is home to over 47,000 students. Ensuring the safety of staff and students during heatwave is critical. This is particularly important for outdoor staff, and for situations when blackout occurs during extreme heat conditions.

Western Sydney University will develop a comprehensive heat safety strategy which involves a multi-faceted approach, including:

- Heat risk assessment and planning – identifying areas and times of high heat risk on campus
- Infrastructure and facilities – designating and equipping cool centres, shaded areas, water stations and ensuring new buildings designed with heat mitigation features
- Policies and procedures, including modifying class schedules, working options and events
- Health and safety measures, including on-going heat illness training for staff and students, emergency response plans, PPE
- Communication and awareness including heat alerts via email and campus apps, educational campaigns and signage
- Temperature and humidity sensor monitoring around campuses and evaluation, feedback and regular reviews
- Collaboration with external partners and agencies, including local health districts, Bureau of Meteorology, and community services.

heatSMART

infrastructure

Greater Sydney is a large, highly interconnected city that depends on a complex network of blue, green and grey infrastructure to function. This infrastructure is essential for ensuring communities and organisations thrive in a warming climate and survive extreme events, however it can be highly vulnerable to heat-related disruptions.

Disruptions of critical infrastructure can impact our city and its people in cascading and compounding ways. Impacting capacity to access work and health care, food security, and stay cool and safe.

This direction seeks to build a systems understanding of how heat impacts resilience within and across infrastructure streams. But also how we can ensure infrastructure design, delivery and operations do not contribute to the urban heat island effect or climate change.

heatSMART
infrastructure

Focus area:
Heat Smart Infrastructure

Interconnected, resilient infrastructure enables communities to survive and thrive.

Infrastructure is the framework upon which cities function.

Heatwaves can cause disruption or failure of city infrastructure, including electricity, water, transport, and telecommunications, with significant flow-on effects for lifeline systems like food supply, medicines, and health services. In large, densely populated areas like Sydney, these disruptions can have complex and cascading impacts.

As our climate warms and heatwaves become more severe there is a need to ensure that infrastructure and services are available when communities need them most.

Heat Smart Infrastructure means heat-resilient design standards and maintenance protocols, integrated approaches to planning blue, grey and green infrastructure, and priority funding for risk mitigation measures.

Train departing the station.

RECOMMENDATION

21. Climate Ready Infrastructure

Establish collaboration forums with the essential infrastructure sector to explore barriers and build opportunities for resilience across infrastructure streams.

By December 2025, the NSW Reconstruction Authority will facilitate the establishment of collaboration forums with infrastructure and utilities to understand barriers and opportunities for enhancing service provision (minimise disruption) in extreme heat and other disasters. This should include a focus on interdependencies between different infrastructure systems, and cascading impacts.

This will also include a training and capacity-building program for industry and infrastructure stakeholders to plan, prepare for and respond to heatwave events, and other disasters in our changing climate.

Proposed Facilitator: NSW Reconstruction Authority

Taskforce Supporters: Ausgrid, Endeavour Energy, local government, Sydney Water, Transport for NSW

Timing: Inaugural forum December 2025, training program in place from June 2026 onwards

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Infrastructure Resilience

Others to engage: Telecommunications providers

Why it's important

Heatwave can cause disruption to, and even failure of city infrastructure, including electricity, water, transport and telecommunications, with flow on effects for lifeline systems like food supply, medicines and health services.

The high interdependency of critical infrastructure systems in cities, means there is a need to bring infrastructure providers together to discuss system-wide issues collectively, and work towards holistic solutions that support our city's climate resilience.

In addition to the technical challenges of infrastructure delivery and adaptation, many infrastructure providers are governed by strict rules and regulations which limit their capacity to change practices. The Taskforce identified opportunities for allied sectors to assist infrastructure providers navigate and advocate for regulatory change to ensure that infrastructure is available when communities and cities need it most.

RECOMMENDATION

22. Heat Smart Movement

Investigate opportunities for climate resilient passenger networks, including: cool transport stops, green active corridors, heat-resilient infrastructure, and heat safe operations.

Improving the climate resilience of passenger networks requires consideration of a wide range of elements, and strong collaboration between different agencies and landowners. Examples include:

- Ensuring all stations are cool, safe places
- Incorporate cool design criteria into bus shelter design guidelines and standards
- Explore opportunities to integrate innovative canopy solutions including solar where appropriate
- Improving air conditioning on trains and buses
- Ensure availability of water at transport nodes
- Explore how public transport can support emergency response during heatwaves
- Identify and activate cool active-transport routes and corridors
- Identify and open-up cool recreational spaces along riparian corridors, flood plain corridors, and other water assets.

Proposed Facilitator: Transport for NSW

Taskforce Supporters: Local government, NSW Department of Climate Change, Energy, the Environment and Water, NSW Department of Planning, Housing and Infrastructure, NSW Reconstruction Authority, Sydney Water

Timing: Ongoing 2025–2030

Status: Scoping | ●

Scale: Greater Sydney, with potential to scale statewide

SDMP link: Infrastructure Resilience

Others to engage: Service NSW

Why it's important

Well-designed adaptive transport infrastructure plays a critical role in protecting passengers from the impacts of heat. Greater Sydney is a large, highly interconnected city, and many residents travel long distances for work and play. A customer-focused approach to public transport that cares for passengers over their entire journey (including transfers) is critical for building the city's heat resilience.

In particular, many at-risk communities depend on public transport for their mobility needs. These communities will benefit most from improvements to our transport network, allowing them better access to services and places of respite.

Improving amenity, reliability and therefore uptake of public transport will also have broader flow-on effects for public health and emissions.

Listening to communities

"My inner-city train got stranded on a 40+ degree day. We were not allowed out because it had stopped in between stations. We were just sitting there for about 30 minutes. The carriage got so hot, I don't think the aircon was working. When I finally got home, I was feeling incredibly unwell, really faint, massive headache and shaky. I was still unwell the day after and had to take a day off from work."

– Judy, 35, Auburn

RECOMMENDATION

23. Heat Smart Energy

Build evidence and knowledge base to understand extreme heat impacts on energy network resilience, and the service needs of customers during heatwaves.

This evidence base should document:

- An assessment of the impacts of extreme heat on operating assets
- An understanding of the role of Distribution Network Service Providers within the regulatory framework to service the needs of customers during heatwaves
- Empirical evidence on the relationship between urban canopy and energy use.

Proposed Facilitator: Ausgrid, Endeavour Energy

Taskforce Supporters: Local government, Western Sydney University

Timing: Mid to late 2027

Status: Scoping | ●

Scale: Greater Sydney

SDMP link: Infrastructure Resilience

Others to engage: Australian Energy Regulator

Why it's important

Electricity resilience is important to manage extreme heat events, with demand typically peaking on a hot day as people turn on their air conditioners. Electricity is already central to the support of other infrastructure such as transport, water, telecommunications, electronic payments and traffic signals.

Energy network providers Endeavour and Ausgrid plan to develop insights into how extreme heat impacts the operation of energy distribution assets and how their services should counter the increasing vulnerability of customers, including Life Support Customers, during these heat events.

At the same time energy network providers face strict regulatory frameworks that determine how they can invest in their infrastructure.

Developing a knowledge base of the heat peril and its potential impacts on energy assets and customers, can help inform a credible evidence base for community consultation and future potential investment needs.

RECOMMENDATION

24. Emission Reduction and Energy Resilience Program

Implement a range of programs to reduce emissions and support the uptake of new energy-saving technologies.

Programs include:

- Reducing energy use in buildings: Expand the National Australian Built Environment Rating System (NABERS) to new sectors, including private hospitals, medical centres and universities. NABERS is a sustainability rating system for buildings. Mandatory disclosure of ratings in office buildings has led to significant reductions in energy use and emissions across NSW.
- Reducing energy use in housing: Expand the Nationwide House Energy Rating Scheme (NATHERS) to all homes.
- Reducing emissions through electric vehicles (EVs): Reduce barriers for the transition to EVs. Including investment in smart and fast charging; installing EV infrastructure in apartments; helping businesses, not-for-profits and local councils transition to EVs; and launching a Vehicle Emissions Star Rating website.
- Increasing renewable energy generation: In partnership with the Commonwealth Government, deliver a new $30 million Solar for Apartment Residents program providing grants to help multi-unit dwellings install shared-rooftop solar.
- Incentives for energy saving appliance and equipment: Provide financial incentives for households and businesses making energy savings upgrades through the Energy Savings Scheme (ESS) and its Peak Demand Reduction Scheme (PRDS).

Why it's important

Climate change mitigation is an important starting point for resilience planning, because if climate change can be brought within manageable bounds, then resilience planning becomes a realistic approach to deal with its consequences. If climate change continues unchecked, a resilient city becomes a more and more challenging goal.

Given the role of climate change in increasing urban heat and heatwave, measures that reduce carbon emissions are a critical element in efforts to reduce urban heat.

Buildings, transport and waste are Sydney's largest emissions categories.

Proposed Facilitator: NSW Department of Climate Change, Energy the Environment and Water

Taskforce Supporters: WSROC, Homes NSW, Local government, Green Building Council of Australia

Timing: Ongoing 2025–2030

Status: Implementation | ● ● ● ●

Scale: NSW

SDMP link: Mitigating Infrastructure

Others to engage: Service NSW, utilities, Local Government NSW, Cities Power Partnership (Climate Council)

RECOMMENDATION

25. Green and Blue Infrastructure

A coordinated approach to green and blue infrastructure delivery and management, accompanied by tools and guidance to support best practice.

This should include:

- Targeted investment in urban greening, public open space and measures to retain more water in the landscape, and ensure water supplies are available for cooling
- Coordinated street strategies for utility placement to maximise tree root and canopy growth
- Support programs to assist local councils to account for green infrastructure in asset registers and ongoing maintenance of green infrastructure
- Tools and guidance to support best practice green space maintenance that supports urban cooling and liveability outcomes including:
  - Best practice guidelines for irrigation of private and public spaces before, during and after various levels of heatwave
  - Coordinated development of these resources to ensure consistency and certainty across public and private sector delivery agencies
  - Dissemination and education program.

Proposed Facilitator: NSW Department of Planning, Housing, and Infrastructure, local government, Sydney Water

Taskforce Supporters: NSW Department of Climate Change, Energy, the Environment and Water, Committee for Sydney

Timing: Ongoing 2025–2030

Status: Scoping | ●

Scale: Greater Sydney

SDMP link: Nature Based Measures

Others to engage: Telecommunications providers, Water NSW, Developers, Parks and Leisure Association, Bradfield Development Authority, Ausgrid, Endeavour Energy, developers

Why it's important

The benefits of green and blue infrastructure are myriad and layered including supporting recreational use, biodiversity, improved social and health outcomes, pedestrian safety, absorption of stormwater, shade, air quality, reduction of urban heat, and more. However, delivering green and blue infrastructure in the right place with the right maintenance plan is essential to maximising the benefits of this significant investment.

In addition, in the context of finite urban space, coordination of competing above and underground services remains challenging. During development of the Heat Smart City Plan, stakeholders strongly agreed that continued coordination and investment in Sydney's green and blue infrastructure will be critical to deliver urban-scale cooling benefits. To be successful, green and blue infrastructure must be funded beyond capital works and include consideration of ongoing management and performance. Improving the valuation of green and blue infrastructure can play an important role in ongoing investment, noting blue and green infrastructure is the only infrastructure class that increases in value after its installation.

CASE STUDY

WATER MANAGEMENT IS EVOLVING TO SUPPORT HEAT RESILIENCE

Water plays an important role in cooling. Many people cope with heat by using swimming pools, water play, misting fans and evaporative coolers. Irrigation can create cooler landscapes and even help cool adjacent buildings. Sometimes, irrigation may also be crucial to enable flora and fauna to survive heatwaves, especially when they occur during drought conditions.

Previously when Greater Sydney has experienced drought, there have been restrictions on outdoor water use. This has been important to ensure that water supplies remain available for essential needs – and uses such as irrigation have not traditionally been viewed as essential. However, as identified in the recent Greater Sydney Water Strategy:[44]

We need to improve how we plan for and manage land use, stormwater and water in the landscape to improve liveability. This includes addressing threats such as intensifying urban heat and urban flood risk and having water available for additional greening, cooling and amenity.

To meet this need, our experience of past droughts has prompted some diversification of Sydney's water supplies, including increased use of rainwater tanks, stormwater harvesting, recycled water and desalination. A broader range of water supply options should help ensure that water is available for cooling, and diversifying supply sources remains a key principle in the current Greater Sydney Water Strategy. The strategy includes a priority "Our city is green and liveable", including "[prioritising] alternative water sources for greening and cooling"[45].

Some of the specific initiatives identified in the Greater Sydney Water Strategy include greater use of stormwater harvesting and recycled water, promoting smart irrigation technology which can improve irrigation timing and effectiveness, and innovations in urban form to provide cool and green features without compromising drinking water supply.

There is more detailed work ongoing to support and develop these initiatives. For example, Sydney Water's 2017 "Cooling Western Sydney" study[38] highlighted the important role of water in cooling, showing that "While greenery does have a cooling effect, the most effective urban heat mitigation technologies are those incorporating a combination of water-based technologies with cool materials." Within Greater Sydney, elsewhere in Australia and internationally, there are many examples where government and other land managers are trialling options to use water more effectively for cooling in the landscape, including active and passive irrigation, water retention in features such as ponds, wetlands, and rain gardens, water infiltration, and deep soil storage.

Woman watering front garden with a hose.

ready

Heatwaves pose a significant threat to human health and are only going to increase in intensity, frequency and duration with climate change. Given projections, the likelihood of a major heatwave emergency impacting our city is almost certain. Given the population density of Greater Sydney, the consequences of an extreme heatwave could be catastrophic.

Greater Sydney needs to be better prepared for heatwaves. Unlike flood, fire or storm, heatwave does not have a dedicated agency managing heat risks, driving community preparedness and coordinating emergency response. This has resulted in an ad hoc, uncoordinated approach to heat at all levels.

This direction refers not only to emergency response, but seeks to encompass the full range of actors and actions required to manage extreme heat across the prevention, preparedness, response, recovery (PPRR) spectrum.

Already, during the development of this plan, work has begun to improve the way heatwaves are managed across our city. However planning and response arrangements remain relatively new and untested - there is a need to work together to build our resilience.

heatWAVE ready

Focus area:
Heatwave Ready City

Clear governance arrangements, funding and guidance supports effective heatwave management.

Heatwaves are a significant and growing challenge for emergency managers in Sydney.

Historically, Sydney heatwaves have not required a significant, coordinated response. However the likelihood of a future heatwave disaster is almost certain.

Heatwaves differ from traditional peri-urban hazards like flood and bushfire in that they are more likely to impact large, densely populated areas with complex infrastructure systems. Further, impacted communities are not clearly defined on a map – with experiences differing markedly within a single street or suburb.

This complexity increases rather than decreases the need for cross-sectoral coordination, and demands a stronger focus on risk reduction and community-led action supported by strong governance.

Phone weather app shows 37.9 degrees Celsius on construction site.

RECOMMENDATION

26. Heatwave in Disaster Adaptation Plans

Reflect Heat Smart City Plan actions in multi-hazard Disaster Adaptation Plans (DAPs) to drive government, business, household and service provider preparedness.

Taskforce stakeholders recommended that the development of future Disaster Adaptation Plans in the Sydney Metropolitan Area should:

- Use the Heat Smart City Plan to inform heatwave actions
- Outline clear pathways for community engagement in the DAP(s) development and delivery
- Identify sustainable funding opportunities for addressing heat hazard where appropriate.

Proposed Facilitator: NSW Reconstruction Authority

Taskforce Supporters: All Taskforce members

Timing: Mid 2025 onwards

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney or sub-regions

SDMP link: Collaborative Governance

Others to engage: The delivery of DAPs should include broad representation from governments, community, business and industry stakeholders. Delivery should be informed by the Community of Practice (recommendation 2), as well as the community advisory group (recommendation 3). Expert advice is to be sought as required.

Why it's important

Unlike flood, fire or storm, heatwave has not historically had a dedicated combat agency coordinating risk management via a Prevention, Preparedness, Response, Recovery (PPRR) approach. This results in an ad-hoc and uncoordinated approach to risk management at all levels. It is recognised that heat is a complex issue involving a diverse array of stakeholders, however this increases rather than decreases the need for cross-sectoral coordination.

The NSW Reconstruction Authority has legislative responsibility for coordinating prevention of heatwave impacts, as well as preparedness for, and recovery from heatwave disasters. The State Disaster Mitigation Plan and Disaster Adaptation Plans provide the governance pathway for this risk reduction work, with the aim of reducing the need to activate emergency arrangements under the Heatwave Subplan.

The Greater Sydney Heat Taskforce has expressed interest in the Heat Smart City Plan to underpin a Disaster Adaptation Plan (DAP) for Greater Sydney. The process undertaken to develop the City Plan could become a pilot for hazard specific consultation in other jurisdictions.

RECOMMENDATION

27. Heatwave Subplan Review

Review the NSW Heatwave Subplan consulting widely and using the Heat Smart City Plan as a reference.

There is a need to update the Subplan to ensure the full Prevention, Preparedness, Response and Recovery (PPRR) spectrum is outlined, and in particular, that roles and responsibilities go beyond information sharing to include practical arrangements for on-ground outreach, emergency transport, and evacuation centre operations.

In addition to Subplan arrangements, a broader review of heatwave processes is required (See Recommendation 29: Heatwave Response Protocols). The Taskforce suggests that this should:

- Clarify roles and responsibilities across PPRR
- Develop arrangements for practical response, including emergency transport and evacuation centres
- Ensure regional and local levels are engaged and educated on new processes and protocols
- Clarifying appropriate practical response measures.

Proposed Facilitator: State Emergency Management Committee and Secretariat

Taskforce Supporters: Local government, NSW Health, NSW Police, NSW Premier's Department, NSW Reconstruction Authority, Western Sydney Regional Organisation of Councils, Resilient Sydney

Timing: 2024 and as required under legislation

Status: Implementation | ●●●●

Scale: NSW

SDMP link: N/A

Others to engage: Emergency Management Committees (Local and Regional), community organisations, healthcare and NDIS providers

Why it's important

Unlike flood, fire or storm, emergency arrangements for heatwave do not currently address the full PPRR spectrum.

In particular, arrangements for practical heatwave response are not addressed in state-level emergency plans.

This results in an ad-hoc, uncoordinated approach to heatwave emergency response. It is recognised that heat is a complex hazard involving a diverse array of stakeholders, however this increases rather than decreases the need for clear cross-sectoral arrangements and coordination.

The current NSW Heatwave Subplan is limited to information distribution in the lead up to, and during a heatwave event. This is not in line with best practice identified in the National Strategy for Disaster Resilience, nor is it in line with the scope of Subplans for other hazards.

RECOMMENDATION

28. Emergency Plan Stress Test

Conduct recurring local and city-wide multi-agency heatwave scenario exercises to inform and improve arrangements.

Such exercises should be delivered in three stages (local, region and state-led) and include consideration of known challenges for heatwave including:

- Community services outreach
- Surge impacts at multiple hospitals across Greater Sydney
- Impacts to transport infrastructure and peak hour commuters
- Impacts to high-rise buildings from energy outages.

Proposed Facilitator: State Emergency Management Committee and Secretariat

Taskforce Supporters: Local government, NSW Health, NSW Police, NSW Reconstruction Authority, Western Sydney Regional Organisation of Councils, Resilient Sydney, energy utilities

Timing: December 2024, reviewed annually for the first five years

Status: Scoping | ●

Scale: Greater Sydney or sub-regions

SDMP link: Community preparedness and awareness

Others to engage: Emergency Management Committees (Local and Regional), NSW Premier's Department, community organisations, healthcare and NDIS providers, utilities

Why it's important

While heatwaves have long been Australia's deadliest natural weather event, planning and response arrangements for heatwave are relatively new and untested.

Due to the wide range of people and systems impacted simultaneously, heatwave emergency response may differ markedly from more traditional peri-urban, locally bounded hazards like flood, fire and storm.

Many Taskforce stakeholders identified the need to undertake heatwave emergency exercises to unpack and understand the types of impacts and challenges that may present themselves during a heatwave emergency. Conducting these exercises will not only improve arrangements for heatwave, but build skills and capacity at state, regional and local levels.

From the frontline

"Due to heat wave conditions [in September 2023] we saw an increase in heart attacks and sudden cardiac death. I don't think we are prepared in western Sydney for what the future holds."

– Faraz Pathan, Staff Cardiologist (Staff Cardiologist / Director of Cardiovascular Imaging and Director of Heart Research

RECOMMENDATION

29. Heatwave Response Protocols

Develop a suite of evidence-based protocols, templates and guidance to inform effective heatwave emergency planning and response.

This guidance should be developed in partnership with key stakeholders and include:

- Template Consequence Management Guides
- Guidelines for identification and operation of heatwave evacuation centres
- Arrangements for emergency transport
- Protocols for formal outreach and practical support activities
- Build on work to date in the Taskforce's Heatwave Management Guide.

Proposed Facilitator: State Emergency Management Committee and Secretariat
Taskforce Supporters: Local government, NSW Health, NSW Police, NSW Reconstruction Authority, Resilient Sydney, Western Sydney Regional Organisation of Councils, Energy and Utility Services Functional Area
Timing: September 2025, reviewed annually for the first 5 years.
Status: Scoping | ●
Scale: Greater Sydney
SDMP link: Capacity and capability
Others to engage: Emergency Management Committees (Local and Regional), community organisations, healthcare, and NDIS providers

Why it's important

Currently there are no standard response protocols for heatwave.

Consultation with regional and local organisations including councils, emergency management committees and community service providers has found that lack of dedicated resourcing, training and capacity building to support agencies and emergency management committees to develop heatwave plans is a barrier to more effective heatwave management.

There are a range of organisations who play important roles in prevention, preparedness, response and recovery of heatwave impacts that work in different functional areas (e.g. health, energy, community resilience) and at different scales (e.g. local, regional, state). These organisations require granular detail to help them improve their heatwave planning and fulfill their responsibilities under the current arrangements. They are looking to the emergency management sector to provide validation that what they are doing is best practice.

In the absence of a combat agency for heatwave, regional and local stakeholders expressed uncertainty about when to activate emergency plans, the types of activities to be undertaken, and by whom.

Developing a suite of agreed, best practice guidance will facilitate better cross-sectoral emergency planning at the regional and local levels – as well as consistent messaging for the community.

Listening to communities

"I go to the local library [during heatwaves]; however, it closes early, and they do not extend their hours."

– Quote from a survey respondent in Penrith[9]

Women keeping cool in local library.

RECOMMENDATION

30. Cool Centres

Initiate a partnership between state government, councils, community sector and industry that tests and evaluates examples of community Cool Centres for the purpose of understanding governance, funding and resourcing requirements.

Cool Centres are an adaptation measure that seeks to 'fill-the-gap' before the activation of formal emergency management arrangements (Figure 8). This program should build on existing trials by individual councils that have identified a range of delivery challenges requiring multi-agency collaboration:

- Determining whether a facility is fit for purpose – accessible, working air-conditioner, backup power
- Cost and logistics of transport to and from the centre
- Duty of care and safety protocols
- Financial barriers of delivery, including staffing and training
- Determining thresholds of activation and communication
- Accessibility, inclusivity, and comfort of community services provided.

Proposed Facilitator: NSW Reconstruction Authority

Taskforce Supporters: Endeavour Energy, Local government, NSW Health, Transport for NSW, Department of Communities and Justice

Timing: Delivered during summer 2025/26, reviewed annually for the first 5 years

Status: Scoping | ●

Scale: Greater Sydney

SDMP link: Social Infrastructure and Cohesion

Others to engage: NSW Department of Communities and Justice, community organisations, healthcare and NDIS providers, universities

Why it's important

There is growing interest and demand for places of community respite from heat.

- >50% of Australian heat deaths occur in and around buildings[2]
- 30% Sydney households don't use air-conditioning[46]
- 45% leave their homes during heatwave[50]

There is an expectation that local government will provide cool centres for the community. However this is a new and challenging space.

Many councils already extend opening hours at venues such as libraries and swim centres during extreme heat, however these venues are not always accessible to those who need them most.

Privately operated places of respite such as shopping centres and clubs can also play an important role in providing respite, but may be unsuitable for individuals susceptible to gambling, alcohol or budgetary pressures.

In Western Sydney where days above 35 degrees are increasing, councils may be expected to run cool centres for the better part of the summer months. The chronic nature of this emerging need falls outside emergency management arrangements for heatwave, and therefore does not attract the same level of multi-agency coordination and funding as evacuation centres.

There needs to be a well thought out approach to the provision of accessible cool centres in the community. The delivery of such spaces requires partnership between state government, councils, the community sector and industry, with a view to assessing needs for long-term funding and guidance.

What are cool centres?

There is rapidly growing interest providing community respite from extreme heat. A range of different terms are used to describe places of respite, and different meanings understood by different audiences. Figure 8 outlines the key definitions used in this Plan.

	Cool Places	Cool Centres	Evacuation Centres
What they are	Existing public or private spaces that provide cooling indirectly or incidently to their main purpose (e.g. pools, shopping centres and parks)	Spaces provided for the purpose of extreme heat respite	Defined facilities under emergency management arrangements
When activated	Normal business hours of operation	Activated temporarily during extreme heat or heatwaves	Declared emergencies only
Audience	General commmunity	At risk community members who need respite, but cannot attend cool places, due to limitations of transport, finance or other	Displaced or high-risk communities
What's needed	Potential increased staff or extension of operating hours	Resourcing required for safe operation. This may include trained staff or volunteers, heathcare oversight transport, and energy backup	Facilitated by DCJ in partnership state and local services. Dedicated funding.

Figure 8. Different respite solutions will suit different audiences.

RECOMMENDATION

31. National Disaster Funding

Establish heatwave as an eligible disaster under the National Disaster Funding Arrangements.

Delivery of this recommendation will require advocacy to the Australian Government outlining the importance of clear funding pathways that allow federal, state and local governments to meet community needs and expectations in the event of a city-scale heatwave disaster.

Proposed Facilitator: NSW Reconstruction Authority
Taskforce Supporters: Taskforce members
Timing: Ongoing (2025 – 2030)
Status: Scoping | ●
Scale: National
SDMP link: Funding
Others to engage: National Emergency Management Agency

Why it's important

The National Disaster Funding Arrangements outline provisions for the flow of funding to state and local authorities where emergencies exceed their capacity to respond.

For eligible hazards like fire and flood, these arrangements support funding for facilitation of setting up and staffing evacuation centres, community support services, and disaster recovery.

If a heatwave disaster including wide-spread energy failure hits Greater Sydney there may be urgent need to unlock funding for support programs, essential provisions (e.g. potable water) and evacuation centres for millions of residents at short notice.

Taskforce members agreed that establishing clear funding pathways for heatwave will allow federal, state and local governments to meet community needs and expectations in the event of a city-scale heatwave disaster.

The establishment of heatwave as an eligible disaster under the National Disaster Funding Arrangements would also have trickle-down impacts for the ways that heatwave is considered in other policies across government and industry.

heatWAVE ready

Focus area:
Heatwave Ready Communities

Communities and organisations are empowered to build resilience, reduce risks and manage emergencies.

Heatwave impacts are experienced differently depending on individuals' physical, mental, economic and social resources. Building heat resilience means working with communities and organisations to:

- Build understanding of heatwave risks,
- Develop strategies that build resilience, and
- Design safety nets for those requiring additional support.

A person-centred approach to building heat-resilience requires collaboration with organisations and professionals working with at-risk individuals including community services, aged care and disability workers, healthcare providers and children.

Western Sydney water park.

RECOMMENDATION

32. Beat the Heat

Develop and circulate annually updated heat risk and safety communications resources and toolkits as part of ongoing annual awareness campaign

This should include ongoing review and improvement of materials across a range of different channels to meet the needs of different audiences. Collaboration with community-facing organisations including councils, community services and healthcare providers is essential to ensure key messages reach communities in a format that suits their needs.

Proposed Facilitator: NSW Health

Taskforce Supporters: local government, NSW Department of Planning Housing and Infrastructure

Timing: Ongoing (2025–2030)

Status: Committed – delivery planning | ● ● ●

Scale: NSW

SDMP link: Community Preparedness and Awareness

Others to engage: Community organisations, RSPCA, energy providers, Sydney Children's Hospitals Network

Why it's important

The NSW Heatwave Subplan identifies NSW Health as responsible for educating the public regarding actions to prevent, reduce or respond to extreme heat.

The Beat the Heat campaign currently provides key messages relating to health including: keep cool, stay hydrated and check on others.

Beat the Heat messaging was formally reviewed by the Heat and Health Research Incubator (University of Sydney) in 2023. With the guidance of NSW Health Strategic Communications resources, messaging and social media have been developed and will be refreshed annually.

Ongoing work to further tailor messaging and channels to suit local audiences will improve campaign reach.

As part of the development of the Heat Smart City Plan it was noted that heat risk communication requires expertise from different organisations. Topics that fall outside of the NSW Health Beat the Heat campaign, but were flagged as important for empowering communities to manage heat risk include home modifications, life support, energy rebates and messages on caring for pets, livestock and wildlife.

There are opportunities for key organisations such as NSW Health, energy providers and the RSPCA to collaborate.

RECOMMENDATION

33. Heat Smart Community Services

Develop and deliver training tools and resources with community stakeholders, organisations and decision-makers to build their understanding and capacity to manage heat risk.

Work with community stakeholders to co-design materials that build preparedness for extreme heat events and heatwaves, ensuring that vulnerable and at-risk communities are supported.

Proposed Facilitator: University of Sydney

Taskforce Supporters: Australian Red Cross, Local government, NSW Health, NSW Reconstruction Authority, Sweltering Cities, Western Sydney Community Forum

Timing: Pilot program delivered summer 2024/25. Ongoing program delivered from June 2025 onwards

Status: Scoping | ●

Scale: Greater Sydney, with potential to scale statewide

SDMP link: Community Preparedness and Awareness

Others to engage: NSW Department of Communities and Justice, Service NSW, community organisations

Why it's important

Organisations that are embedded and have strong relationships with communities will often be the first point of contact for people needing assistance before, during or after a heatwave. Increasing the resilience capacity of these organisations will help them understand how to best support at-risk groups and adapt to rising temperatures.

The University of Sydney is seeking to develop and deliver training toolkits and education materials (e.g. short courses) on managing heat risks. Many Taskforce members strongly supported this recommendation and identified that a cross-sectoral approach is required to reflect the diversity and breadth of community sector work including health advice, business operations, government support pathways, and transport arrangements.

From the frontline

"...Because we are a community centre and because we are visible, when there's a disaster or when people don't know what to do they will turn to us. Our funding partners...seemed to be unaware of that...within our work you have to be able to make a one-eighty degree turn in a day in the work that you do."

– Bligh Park Community Services Inc.[47]

RECOMMENDATION

34. HeatWatch App

Personalised heat-health risk alert app with accompanying evidence-based cooling and hydration advice.

The HeatWatch app provides users with personalised heat-health risk information, and strategies to keep cool and safe during extreme heat. This next phase of the HeatWatch App will scale up accessibility and usability of the app.

Proposed Facilitator: University of Sydney
Taskforce Supporters: local Government, NSW Health, NSW Police, NSW Reconstruction Authority, Sweltering Cities, Western Sydney Community Forum, Western Sydney Regional Organisation of Councils
Timing: 2025–2027
Status: Committed – seeking funding | ●●
Scale: Greater Sydney, with potential to scale nationally
SDMP link: Community Preparedness and Awareness
Others to engage: Bureau of Meteorology, community organisations

Why it's important

Heatwaves pose a significant threat to human health and are only going to increase in intensity and frequency with climate change.

Currently, heatwave warnings are delivered at a metropolitan or state level, and often only reflect temperature values, with a lack of information on the health risk of heatwaves, and actions people can take to reduce impacts to their health.

Significant climatic variations across our city, combined with varied physiological risk (e.g. age) and personal behaviours (e.g. occupation), can make it difficult for individuals to understand their personal heat-health risks and the actions they should take to manage them.

The HeatWatch application provides users with personalised heat-health risk information, and low-cost evidence-based strategies to keep cool and safe during extreme heat. It also allows people to understand how heat health risk varies across the community and better support vulnerable friends and family. The application was developed in cooperation with experts, local government, NGOs, and community members, and trialled in Western Sydney over summer 2023/24.

The next phase of the HeatWatch application focuses on evolving the application in terms of accessibility and useability, but also assessing its impact on health outcomes. The application has the opportunity to scale up, and to be modified for specific settings, including schools and hospitals.

There is also the possibility to explore how HeatWatch can be integrated into existing applications, e.g. Service NSW or Hazards Near Me.

RECOMMENDATION

35. Heat Smart Healthcare

Develop and deliver training tools and resources for caring professionals including medical, nursing and aged and disability care workers.

An education and training program or package to ensure medical and caring professionals are equipped to help individuals manage their risk.

Proposed Facilitator: NSW Health

Taskforce Supporters: University of Sydney

Timing: From June 2025 onwards

Status: Implementation | ●

Scale: Greater Sydney, with potential to scale statewide

SDMP link: Community Preparedness and Awareness

Others to engage: Australian Department of Health and Aged Care, NSW Australian Medical Association, Primary Health Networks, Local Health Districts, NSW TAFE, non-government organisations (Kidney Health Australia, Diabetes Australia, Heart Foundation), specialist medical colleges, carers organisations, Sydney Children's Hospitals Network

Why it's important

Individual heat risk can be significantly impacted by a range of factors including age, physical disability, mental health, co-morbidities, or medications. For example, public messaging regarding hydration may need to be modified for individuals on fluid restrictions. In other cases, relatively young, healthy individuals being treated for seasonal allergies or anxiety may be unaware that medications reduce their body's ability to manage heat. It is important that medical and caring professionals are equipped to help individuals manage their risk on a case-by-case basis.

At the institutional level, The Royal Commission into Aged Care Quality and Safety 2020 highlighted some significant shortcomings in the aged and disability care sectors. Services and facilities catering to this cohort should be required to implement and review heatwave risk assessments, planning and training on a more regular basis.

From the frontline

"I was working in an age care facility that did not have all rooms air-conditioned. Some clients [who] had cognitive loss [would] revert to old habits of opening windows to have a breeze. It was the worst when there was a week of heat and no cool breeze at night. On very hot days we would take small ice blocks around to people but got in trouble when we provided a second ice block in the late afternoon due to a lack of resources."

– Lenore, 60, Aged Care Worker

RECOMMENDATION

36. Social Cohesion Program

Measure, understand and improve social cohesion of Greater Sydney communities (aligning to State Disaster Mitigation Plan).

This recommendation seeks to coordinate between government agencies across the three tiers of government and the community sector to develop a shared understanding and common metrics to enable more effective and informed decision making to improve local social cohesion.

Proposed Facilitator: Resilient Sydney

Taskforce Supporters: Local government, NSW Reconstruction Authority, Sweltering Cities

Timing: Ongoing (2025–2030)

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney, with the potential to scale statewide

SDMP link: Social Cohesion

Others to engage: NSW Premier's Department, Primary Health Networks, Local Health Districts

Listening to communities

"When asked about her worries for this upcoming summer, Sue shares that her mental wellbeing suffers when she is at home all day. As a retiree, hot days inhibit Sue from pursuing her outdoor hobbies and limit her social interactions, leading her to become "worried about isolation."

– Sweltering Cities, Summer Stories 2023/24

Why it's important

Social connectedness and social capital significantly contribute to the resilience of communities in NSW. Social ties foster collective action in response and recovery to shock events, as well as in proactive resilience building and adaptation to emerging risks. People living in NSW are regularly subject to multi-hazard natural and economic disasters and more infrequently to social disruptions such as cyber-attacks, terrorism threats, protest, and riots. Currently, there is limited data and analytics available in NSW and Australia for measuring social capital for state and local governments. Governments need this data to confidently plan for and invest in community resilience programs and infrastructure.

Social infrastructure plays an important role in communities adapting to and recovering from shocks and stresses. Strong bonding, bridging, and linking social ties to neighbours and a sense of place, help build back communities from natural disasters.

Investing in social cohesion metrics and data collection can provide valuable insights into community sentiment and help identify areas for intervention and support. By understanding the structure and dynamics of social networks, policymakers can better tailor intervention strategies and support mechanisms to aid in disaster response and recovery efforts.

New government-led metrics to track and understand social connectedness and social capital in NSW communities will be a crucial step in enhancing disaster response and recovery efforts in the future.

The Resilient Sydney Strategy (2018) identified social cohesion between different communities is decreasing and social isolation is increasing as an immediate challenge across Australia. Better coordination across Greater Sydney and NSW is required to address the growth of inequity undermining the vital connections we need to both live well and to better respond together in a shock event.

RECOMMENDATION

37. Heatwave Safety Net

Establish check-in program for priority at-risk individuals as part of heatwave management (e.g. Red Cross TeleCross REDi).

Check-in program that assists at-risk and isolated people cope with extreme heat events. Registered individuals receive a daily call to check they are okay. If an individual is not coping or does not respond, other services are alerted (e.g. Ambulance or Police).

Proposed Facilitator: Australian Red Cross

Taskforce Supporters: NSW Health, NSW State Emergency Management Committee, Sweltering Cities, Western Sydney Community Forum

Timing: Ongoing (2025 – 2030)

Status: Scoping | ●

Scale: Greater Sydney, with the potential to scale statewide

SDMP link: Community Preparedness and Awareness

Others to engage: Primary health networks, local health districts, NSW Australian Medical Association, NSW Premier's Department

Why it's important

Social isolation is a leading risk factor for heat-related risk. Many of our most at-risk communities have limited capacity to seek cool spaces or travel during extreme heat. This includes people with disability, are experiencing mental illness, are housebound, frail, aged, or are recovering from an illness or accident. Outreach programs offer an effective mechanism for monitoring the wellbeing of at-risk individuals and providing targeted support where required.

South Australia's Telecross REDi program is an example of an outreach program that assists at-risk and isolated people cope with extreme weather events. The service calls registered individuals daily to check they are okay. If an individual is not coping or do not respond, Red Cross staff alert other services (e.g. Ambulance or Police). Individuals may register themselves or be registered by their doctor, support worker or a family member. The program is delivered by the Red Cross and funded by the South Australian Department of Human Services.

The introduction of a heatwave check-in program in NSW also meets a key need expressed by local government and community sector organisations during development of the Heat Smart City Plan. It provides a clear referral pathway that can be used to proactively connect at-risk individuals with a measure of support where there is concern about their welfare, but an immediate healthcare response is not appropriate.

IMPROVING HEATWAVE EMERGENCY MANAGEMENT

Like other extreme weather events, heatwaves can lead to emergencies requiring a significant coordinated response. Heatwaves have the potential to cause serious illness including heat exhaustion and heat stroke. However our capacity to implement an effective health response may be hampered by the failure of city systems.

The sensitivity of electricity generation and distribution infrastructure to extreme heat is a key risk factor. Energy infrastructure failure can cause the significant and cascading failure of essential city infrastructure including cooling systems, transport systems, telecommunications, electronic payment systems, water and wastewater pumps, access systems (e.g. lifts, escalators and automatic doors), and other equipment.

While failure of any of the above city systems has the potential to create significant disruption, combined together, over a large urban area like Sydney, the scale of consequences could quickly overwhelm the capacity of individual organisations to respond. These impacts will be further exacerbated where heatwaves coincide with hazards like bushfire, drought and storms.

NSW has arrangements for heatwave emergency management, including a State Heatwave Subplan, however arrangements for heatwave are far less mature than for other hazards such as bushfire or flood. As the risk and impacts of heatwave increase, there is a need to build on, and improve these arrangements. Opportunities identified by Taskforce stakeholders include:

- **Improving hazard definitions and warnings:** Heatwave is currently defined by the Bureau of Meteorology as three or more consecutive days of unusually hot maximum and minimum temperatures for a location. While this definition is important for maintaining consistent climate records, it has little to do with heat hazard impacts to humans, urban systems and the environment. More work is needed to understand the thresholds at which different heat impacts occur, so that heat response measures and messaging can be rolled out in the most effective way.
- **Building links between local, regional and state level response:** While the State Heatwave Subplan focuses on coordination between state agencies, many uncertainties remain about what is likely to occur during an extreme heatwave, how different responses will be coordinated, and what this will mean for local organisations trying to manage impacts on the ground. There is a need build understanding between organisations operating at different scales to ensure arrangements work as intended. In this emerging space, learning-by-doing will be key. There is a need to build knowledge at all levels through scenario testing, knowledge sharing, and sector-wide capacity building.
- **Building capacity of local organisations involved in heatwave management:** During a heatwave, local organisations such as councils, community service organisations and health services play an important role in supporting local communities to prepare, respond and recover from heatwaves. At present this role is not formally recognised or supported despite being critical to effective emergency response; whether sate, regional or locally-led.
- **Providing greater support to high-risk individuals:** During a heatwave, some individuals need additional support. People experiencing homelessness and those in poor quality housing may need respite from the heat. People with limited mobility may need additional support to access essential services. People who are isolated may benefit from more frequent check-ins. Current arrangements do not cover practical response measures. While some small-scale interventions are being trialled across Greater Sydney, further investment is needed to support expansion, and measure effectiveness of these interventions.

Emergency Department entrance at Hawkesbury District Hospital.


EMERGENCY
Emergency
Main Entry
Emergency
Set Down
Parking
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RECOMMENDATION

38. Heat Smart Learnings

Deliver the interdisciplinary program 50°C: Climate, Heat and Resilience in high schools in greater Sydney to increase awareness and interest in the different aspects of heat resilience as they intersect across the curriculum.

Develop and deliver a program that builds discipline specific knowledge and skills associated with fieldwork, data science, communication, and community leadership. This program connects students with experts to explore climate science and extreme heat through data, and learn about design and materials solutions, heat and health and how to build community resilience. They will conduct a school microclimate investigation and design and implement changes to cool their spaces, develop heat smart messaging for their local community and develop a personal or school interest project connected to the program. These projects will be showcased as part of the 50°C Summit at the culmination of the program in April.

Proposed Facilitator: Powerhouse, supported by the NSW Office of the Chief Scientist and Engineer

Taskforce Supporters: Western Sydney University, University of Sydney, University of New South Wales, Sydney Water, Red Cross, Blacktown City Council

Timing: 2024-25

Status: Implementation | ● ● ● ●

Scale: Western Sydney with potential to scale statewide

SDMP link: Community Awareness and Preparedness

Others to engage: University of Technology Sydney, NSW Department of Education

Others we are working with include: Organisations that are collaborating on this initiative include: NSW Education, City of Parramatta, Cumberland City Council, CSIRO, Greening Australia

Why it's important

Young people are the future. It is critical to ensure today's youth are aware of heat risk and are actively involved in designing preventative action for the future, to adapt and build resilience in their communities.

This learning program will increase students' interest, participation and understanding of STEM in relation to climate science, natural hazards response and management.

This program will have a focus on Western Sydney, and includes the following areas:

- Climate Science
- Microclimates and Urban Heat
- Technology, Data and Communication
- Materials Science and Design Solutions
- Heat, Health and Community Resilience
- Creative Community Storytelling

Students will have hands-on experiences with technology and how to adapt spaces to support urban cooling. They will communicate their learning to a specific local audience, socially diffusing adaptation and resilience strategies from emerging and current research and practices.

The program will develop understanding of key concepts, content and skills across key NSW mandatory syllabuses for Geography, Science, Design and Technology, English and Visual Art.

heatSMART

research

Whether talking about infrastructure, health, community or emergency management, research is an essential starting point for designing effective strategies to build heat resilience. However, the full potential of research can only be achieved when new knowledge is linked with opportunities to pilot, revise, and operationalisation.

During the development of the Heat Smart City Plan, Taskforce stakeholders agreed there is a need to build stronger links between research and practice.

This direction seeks to connect practitioners and researchers in order to:

- Ensure practitioners have access to data that supports them in their work
- Better understand gaps in current knowledge
- Design new research that directly supports practical application
- Support cross-disciplinary and cross-institutional approaches that reflect the complexity of real world challenges
- Establish pathways for moving research towards application, operationalisation and standardisation as appropriate.

heatSMART collaborative research

Focus area: Collaborative Research

Researchers and practitioners work collaboratively to deliver heat resilient solutions.

While there is much we do know about the magnitude and nature of heat impacts in Greater Sydney, many gaps remain. A research collaboration between universities and practitioners is essential for understanding these challenges, as well as creating opportunities for application, operationalisation and standardisation of solutions that build the resilience of our city.

Taskforce members meet with expert reference panel.

RECOMMENDATION

39. Collaborative Research Program

Establish Sydney's first Heat Smart City Collaborative Research Program across Sydney's universities, utilities, industry, NGOs, NSW Government, and Greater Sydney councils.

The program should be multi-disciplinary and practice-driven with a focus on providing practitioners and policy makers with actionable insights to drive implementation and improve individual and community health in relation to extreme heat and hot weather.

The Collaborative Research Program should consider:

- Practitioner committee made up of public and private sector professionals to guide design of research proposals
- Co-led by the three universities that participated in the Heat Taskforce, with each university chairing and coordinating in rotation.

Proposed Facilitator: Collaboration between, University of Sydney, University of NSW, Western Sydney University

Taskforce Supporters: Taskforce members

Timing: Ongoing (2025 – 2030)

Status: Committed –seeking funding | ● ●

Potential funding sources: NSW Government and private sector partners, National Health and Medical Research Council funding schemes, Australian Research Council

Scale: Greater Sydney

SDMP link: Data

Others to engage: International academic collaborators and inter-state collaborators, professional associations such as Australian Institute of Landscape Architects, AIA, Engineers Australia, EIANZ, Bradfield Development Authority, Other universities

Why it's important

While much research on heat exists, the Taskforce has identified a need for a collaborative approach to address existing gaps in research, and to better link research with implementation. Data and research gaps as identified by the Taskforce, include:

- Health data linked to heat and location (e.g. hospital admissions, ambulance call outs, emergency presentations and mortality – linked to risk factors, mental health impacts, real time data on occupancy (beds / admissions)
- Vulnerability data linked to heat and location (e.g. where both disadvantaged populations and the services that help them are)
- Economic data linked to heat (e.g. data linking heat to quantifiable impacts on biodiversity, business, tourism, trade, productivity, healthcare expenditure, infrastructure, service disruptions, crime and violence, utilities data)
- Cost-benefit analysis of better urban and home design (e.g. lifetime costs / benefits, cost of inaction)
- Psychological and socioeconomic impacts (stress, well-being, and socioeconomic effects on vulnerable populations)
- Behavioural and social responses, including community engagement (e.g. public awareness and adaptation behaviours)
- Policy and governance (effective heat risk management policies).
- Technological Solutions (including energy innovations)
- Long-term climate projections, including future heat patterns and frequency of heatwaves
- Urban planning (strategies for heat-resilient urban infrastructure)
- Water resources (including impact of heat on water availability and quality)

RECOMMENDATION

40. Heat Smart Database

Establish a multi-indexed database of Sydney's dispersed collection of existing information that enables researchers, utilities, industry, government agencies and councils, NGOs to upload open access research, data and case studies to improve the capacity of the region to respond to heat risks.

It is recommended that the three universities that are on the Taskforce Expert Reference Panel collaboratively develop and maintain the database in a centralised platform.

Three universities are to establish a joint committee responsible for oversight of the open-access resource, ensuring data quality, regular updates and user support. It would feature user-friendly tools for data analysis and visualisation.

Proposed Facilitator: Collaboration between, Sydney University, University of NSW, Western Sydney University

Taskforce Supporters: All Taskforce members

Timing: Scoping and logistics to start 2025 among three universities but requires on-going secure funding to operationalise

Status: Committed – seeking funding | ● ●

Scale: Greater Sydney

SDMP link: Data

Others to engage: International and inter-state and federal agencies and collaborators, Australian Institute for Disaster Resilience

Why it's important

Currently much research and information on heat risk management is dispersed across different sources. Ensuring agreed data sets, information and research is freely and easily accessible to practitioners will support better outcomes.

Centralised and standardised data improves decision-making, enhances collaboration, and reduces resource duplication. It provides a holistic view of heat risks for comprehensive assessment, supports timely response and adaptation, and fosters public awareness and engagement. Ultimately, accessible data is essential for long-term planning and effective heat risk management.

Research on the physiological impacts of heat at the heat and Health Research Centre, University of Sydney. Credit: University of Sydney / Stefanie Zingsheim.

Ceiling fan in child’s bedroom.

SECTION 4:

Implementation and governance

IMPLEMENTATION AND GOVERNANCE

The next step towards delivery of a heat resilient city is the development of a Heat Smart Implementation Plan. The Implementation Plan will detail the funding, timing and reporting of the actions over the 2025-2030 timeline.

The Taskforce has been established as an advisory body and does not have executive powers. Therefore, the governance for the development and delivery of the Implementation Plan must be identified. The Taskforce has outlined the following needs for this governance:

- Ensure mixed, multi-sector stakeholder governance, similar to the current composition of the Taskforce, in order to maintain the dynamism and Greater Sydney focus of the process so far. This is important to:
  - Meet the multi-faceted requirements of the complex system we are operating in.
  - Avoid relying entirely on the mandate of the auspicing organisation, for influencing whole-of-government decisions.
  - Help ensure the governing body is not overly state government-led.
  - Enable community insights to feed into the process and for community stakeholders to help translate Heat Smart City Plan actions within communities.
- The governing body should include senior representation within and beyond NSW Government to maximise delivery of actions
- The terms of reference should be setup in a way that maximises
  - accountability for progress on all action directions
  - the likelihood that the governance will outlive future changes of government

There are opportunities for ongoing governance through the Disaster Adaptation Plan (DAP) governance framework.

EVALUATION

Taskforce stakeholders are committed to building Greater Sydney's heat resilience and believe that to be effective and impactful, the implementation of the Heat Smart City Plan must be supported by robust evaluation that performs a range of functions:

- **Governance** – Evaluation should allow the Plan's governing body to understand how well implementation is progressing so that approaches can be refined to maximise effectiveness. This includes what is hindering and enabling progress.
- **Transparency** – Communities are the ultimate beneficiaries of an effective Heat Smart City Plan. It is important that we can communicate how the Plan is progressing. This includes what recommended actions are being invested in and implemented, and the difference that is making to ensuring people in Greater Sydney can survive and thrive in a warming climate and during extreme heat events.
- **Funding** – It's important that current and future funders understand how the Plan is progressing, to give them confidence in their current investment, and to continue to attract further investment to implement recommendations.
- **Visibility** – Finally, evaluation will help all actors who have a role in making a difference to the way heat is managed in Greater Sydney to see, and continue to play, their part in delivery of the Plan.

Given these needs, the evaluation of the effectiveness and impact of the Plan will have dual purposes of accountability (back to community and funders) and learning.

A separate Evaluation Plan, based on the Heat Smart City Plan's Theory of Change, will be developed as part of the Implementation Plan. The primary aim of evaluation will be to better understand the contribution the Plan's recommendations are making to expected system improvements.

The Theory of Change shows how we expect the recommended actions will 'work' to create the change we want to see. Establishing measures and monitoring questions against the Theory of Change, and collecting data against those, will provide the evidence to tell the actual story of change.

Measures of effectiveness and impact will include both quantitative and qualitative metrics, and measurement will be rounded out with case studies of where and how change has occurred.

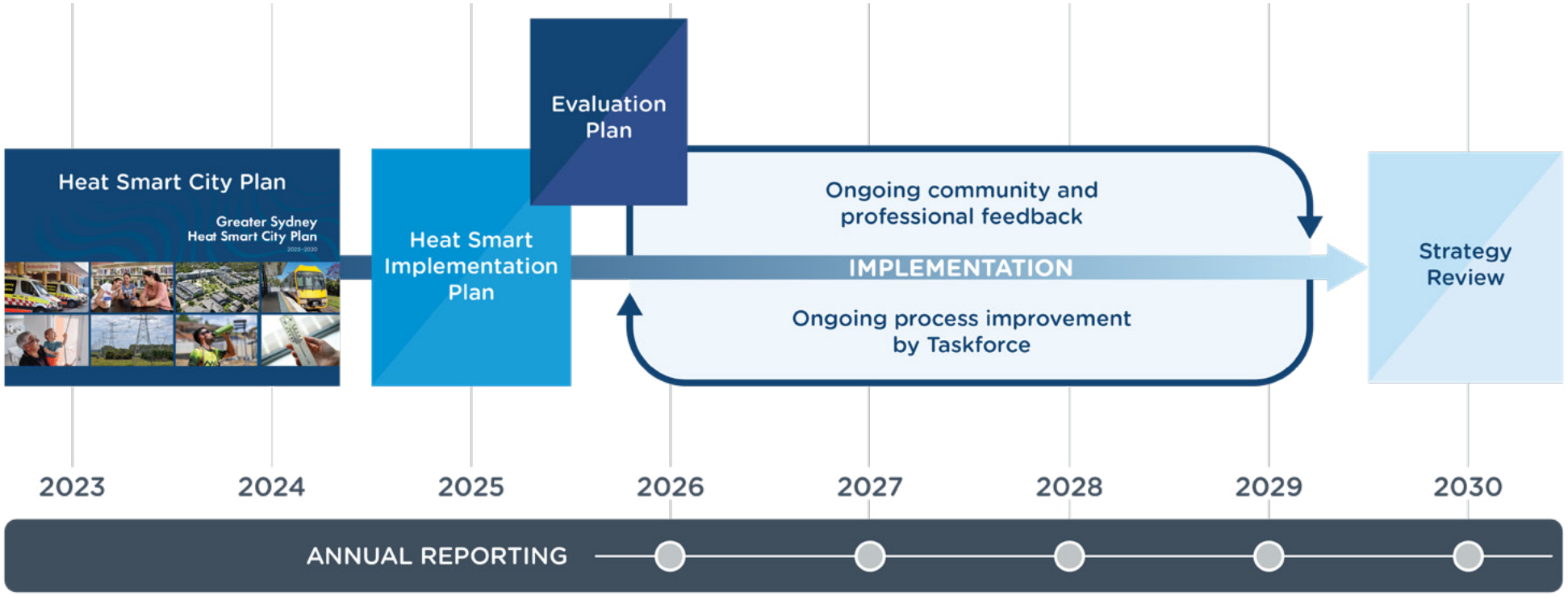
The Evaluation Plan will also outline a process for continuous improvement to maximise effectiveness and impact. This would include a process of regular (likely quarterly) review and sense making of measurement data and lessons learned, to prioritise or adapt efforts over the following quarter.

Woman in cool, green space near apartment block.

TIMELINE OF IMPLEMENTATION (NEXT STEPS)

The Heat Smart City Plan was developed through a co-design process in 2023-2024, and is set to be implemented 2025-2030.

Taskforce partners will work together to develop a detailed Implementation Plan and evaluation program. Delivery of recommendations will be supported by regular internal and public feedback loops integrated in the Evaluation Plan.



GLOSSARY

Adaptation Projects and programs designed to reduce risk and help residents and organisations better cope with the impacts of heat.

Adaptive capacity is the ability to change processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities.

Blue space In the urban planning context comprises all the areas that consist of surface waterbodies or watercourses such as ponds, lakes, rivers, and streams.

Cascading risk occurs when cascading effects increase in progression over time and generate unexpected secondary events, as serious as the original event and contributing significantly to the overall impact of a disaster. An example would be when heatwaves cause major power network outages.

City resilience The capacity of individuals, communities, businesses, and systems within a city to survive, adapt and thrive no matter what kinds of chronic stresses and acute shocks they experience.

Compounding risk describes the risks associated with hazard events that occur simultaneously and combined with conditions that amplify the overall impact. An example would be when heatwaves, droughts and bushfires occur together.

Cool places Existing public or private spaces that provide cooling indirectly or incidentally to the main purpose (e.g. pools, shopping centres and parks).

Cool spaces Spaces provided for the purpose of extreme heat respite. Activated temporarily during extreme heat or heatwaves. Generally aimed at at-risk community members who need respite, but cannot attend cool places due to limitations of transport, finance or other.

Deep soil A landscaped area connected horizontally to the soil system and local ground water system beyond and is unimpeded by any building or structure above or below ground with the exception of minor structures.

Emergency The State Emergency Rescue Management Act 1989 (SERM Act) defines emergency as "an actual or imminent occurrence (such as fire, flood, storm, earthquake, explosion, terrorist act, accident, epidemic or warlike action) which:

a. endangers, or threatens to endanger, the safety or health of persons or animals in the State, or
b. destroys or damages, or threatens to destroy or damage, property in the State, or
c. causes a failure of, or significant disruption to, an essential service or infrastructure being an emergency which requires a significant and coordinated response."

Evacuation centre Formal emergency management arrangements that provide welfare services for those affected by a disaster.

Extreme heat Defined by the Climate Council as temperatures 40°C and over.

Extremely hot days Defined by the Climate Council as temperatures 40°C and above.

Green space Open-spaced areas such as parks, lawns, community gardens and other vegetated areas.

Hazard Hazard is an event or phenomena that may pose risks to human settlements or the environment.

Heatwave Occurs when the maximum and the minimum temperatures are unusually hot over a three-day period at a location. This is considered in relation to the local climate and past weather at the location.

Hot days Defined by the Climate Council as days between 30°C and 35°C.

LGA Local government area

LHD Local health district

Morbidity Morbidity is a term used to describe incidence of an illness or disease or condition occurring in a specific area

NatHERS The Nationwide House Energy Rating Scheme (NatHERS) is an Australian star rating system that rates the energy efficiency new homes, based on their design.

Reduce Involves reducing average ambient temperatures in the built environment as much as possible.

Response There will still be residual heat-related risk in extreme events, and therefore we also need emergency preparedness and response measures, particularly to help at-risk people in the community.

SA1 Statistical Area Level 1 (SA1) – this is the smallest geographic area with disaggregated Census data available, and averages 400 usual residents.

Systemic risk is risk that is embedded in a system, understood through systems analysis to have a latent or cumulative risk potential to negatively impact overall system performance when some characteristics of the system change. An example is the interaction between heatwave risks and social disadvantage.

Thermal comfort The condition of mind that expresses satisfaction with the thermal environment; i.e. the conditions in which a person feels neither too cold nor too warm.

Thermal safety The condition of body that maintains balanced heat gains and losses with the environment to avoid inducing a dangerously low or high body temperature. A thermally safe environment remains within a range of temperatures that protect people from injury or death resulting from over-heating or over-cooling.

Universal Thermal Climate Index (UTCI) A standard measure of "feels like" temperature. Calculated using a combination of air temperature, humidity, wind speed and radiation.

Urban heat A general term that refers to high temperatures in urban areas that pose a risk to our communities and infrastructure.

Urban Heat Island Effect (UHI) The tendency of cities to be much warmer than their rural counterparts. Urban surfaces such as roads and roofs absorb, hold, and re-radiate heat; raising the temperature in our urban areas. Human activities such as traffic, industry, and electricity usage also generate heat that adds to the urban heat island effect.

Urban heat mitigation Projects and interventions that seek to reduce the root cause of urban heat (and therefore the temperature) through either an increase in green canopy, use of more building and paving reflective materials, use of irrigation and water features.

Very hot days Defined by the Climate Council as days between 35°C and 40°C.

Vulnerable or at risk communities Any person or group of people at greater risk of heat-related impacts due to greater exposure (hotter temperatures), physical characteristics that make them prone to heat-related illness (chronic disease, mental health, old-age), or socio-economic circumstances that limit their capacity to respond (low-income, lack of transport, tenancy, social networks).

Water sensitive urban design (WSUD) An approach to urban water management that aims to minimise impacts on the natural water cycle.

Child keeping cool in a backyard swimming pool.

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