Burning Money

The rising costs of heatwaves to Western Sydney

Committee for Sydney

Contents

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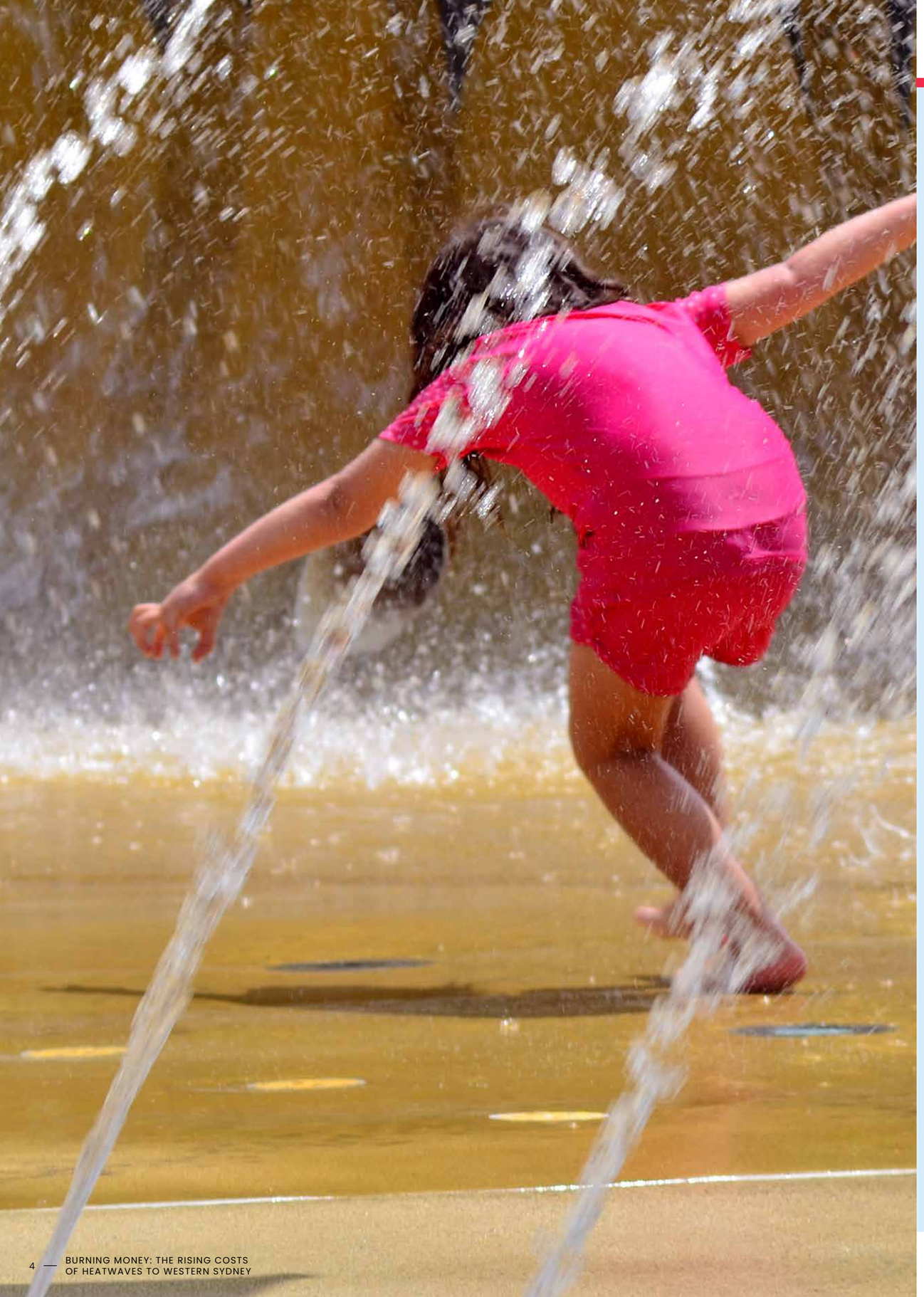

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Scyne Advisory are public purpose specialists who support governments and their agencies to deliver services to Australians, helping government to build more resilient, equitable, secure and prosperous communities.

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Executive Summary

Over the next 50 years, heatwaves will drive an increase in economic, social and health costs to Western Sydney by more than 400%[1].

These costs will be paid by us – the residents, businesses and taxpayers of Sydney and NSW.

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

Every time the mercury reaches 35C, homes and businesses are burning money across Western Sydney.

These impacts will not be felt uniformly across Western Sydney[1]. Factors including topography, building construction, age and wealth of the occupants of each building, all affect people's level of risk from heatwaves, as does the extent of underlying health conditions[2].

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

We don't yet fully understand the direct impacts of heatwaves on business activity within and beyond the city. What we do know is that heat will constrain outdoor operations and maintenance, including utilities (energy and communications), construction and the logistics sectors. Indirect costs also need to be factored in, including the cost of cascading impacts such as melting road and runway surfaces, as well as the buckling of railways due to thermal expansion[3].

Far more important than lost productivity, we know that heat contributes to people losing their lives at work, on the sporting field and in their homes in Sydney. Heat is Australia's 'silent killer', responsible for more deaths than all other natural disasters combined most commonly by exacerbating other underlying health conditions or vulnerabilities.[3]

This report focusses on quantifying the economic costs of the increased frequency and intensity of heatwaves, which will see a sharp jump in the average number of days over 35C, rising from 10 days in the period 2010-2019 to 20 days in 2070-2079[2].

The impact of increased heatwave days, when combined with a growing population, will mean a steep increase in cooling energy costs for households, detrimental health costs due to heat stress and productivity loss for key industries.

Other tangible and intangible costs include impacts on mental health, human wellbeing and active lifestyle, education disruption and exacerbated chronic illnesses.

1 Unless otherwise referenced, all statistics in this report have been modelled specifically for this report using the methodology articulated in Appendix A.

2 The modelling in this report uses the Intergovernmental Panel on Climate Change (IPCC)s RCP 4.5 climate projections, described as a moderate scenario in which emissions peak around 2040 and then decline.

Without accounting for any mitigating actions, the economic costs to Western Sydney from rising heat and a growing population have been modelled as follows:

- The population exposed to negative health impacts (people multiplied by heatwave days) will dramatically increase, rising from 14 million today to **over 100 million in the 2070's**, with nearly a quarter (23%) of the population affected being vulnerable communities (Figure 1)
- At an aggregate level, **the real costs from heatwaves quadruples from $1.4billion today, to on average, more than $6.8billion by the 2070s**.
- More than half (59%) of this $6.8billion is attributed to the health costs experienced by a larger and older population, followed by cooling costs (13%) and lost productivity (28%):
- Heat stress presents significant health costs for Western Sydney residents, with the current path suggesting a $4.1billion burden in the 2070s, up from $637million in 2023.
- For Western Sydney residents, **the cooling component of energy bills is set to jump by 44% per household**, due to the increased amount of cooling required to counter the impacts of a warming environment.
- Estimated annual productivity loss across the workforce could climb from $423million in 2023 to around $2billion by the 2070's.

Cost of living is at the heart of this report, with heatwaves costing Western Sydney's businesses and communities $1.4 billion today. This significant cost comprises over $650 in additional per capita costs today (productivity losses, health costs, and costs of household cooling), and all three components of these per capita costs will increase over the next 50+ years (Figure 2).

As a region that will experience increasing heatwave risk, how Western Sydney grows and adapts to heatwaves is critical for those living and working today and tomorrow. More attention is therefore also needed on the aggregated impacts of lost productivity on the Sydney and NSW economy as a whole.

"High temperatures are dangerous to everyone, but infants, children, the elderly, pregnant women, outdoor workers, homeless individuals, and those with pre-existing conditions are all especially vulnerable to heat-related illness and death." [30]

Figure 1 Collective heatwave days experienced by Western Sydney population (RCP 4.5)

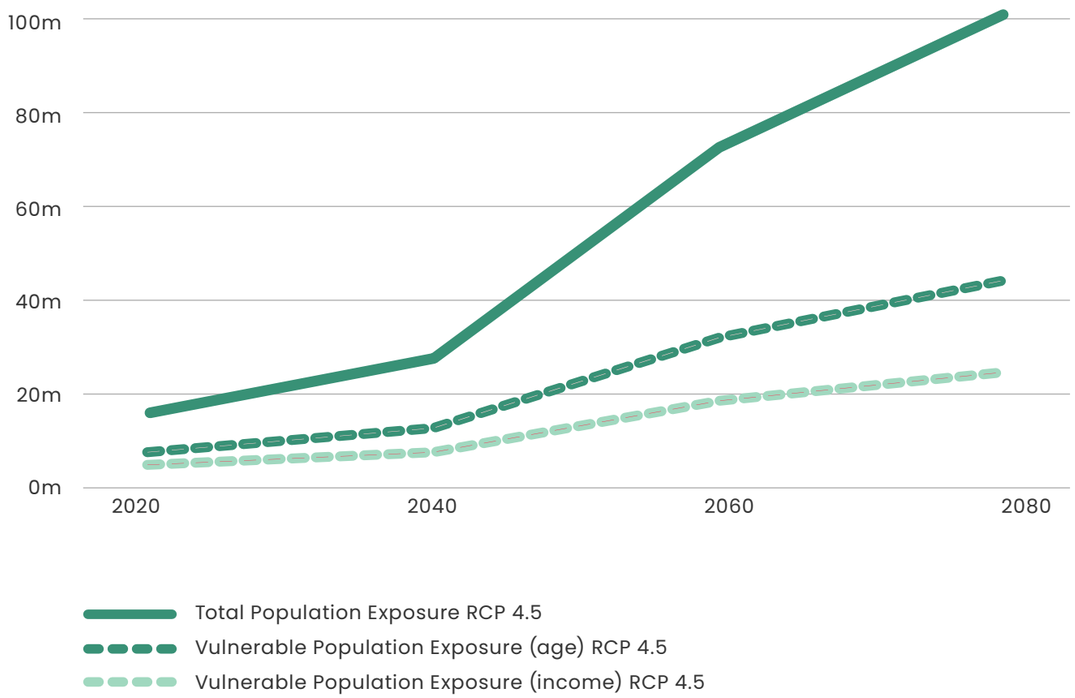
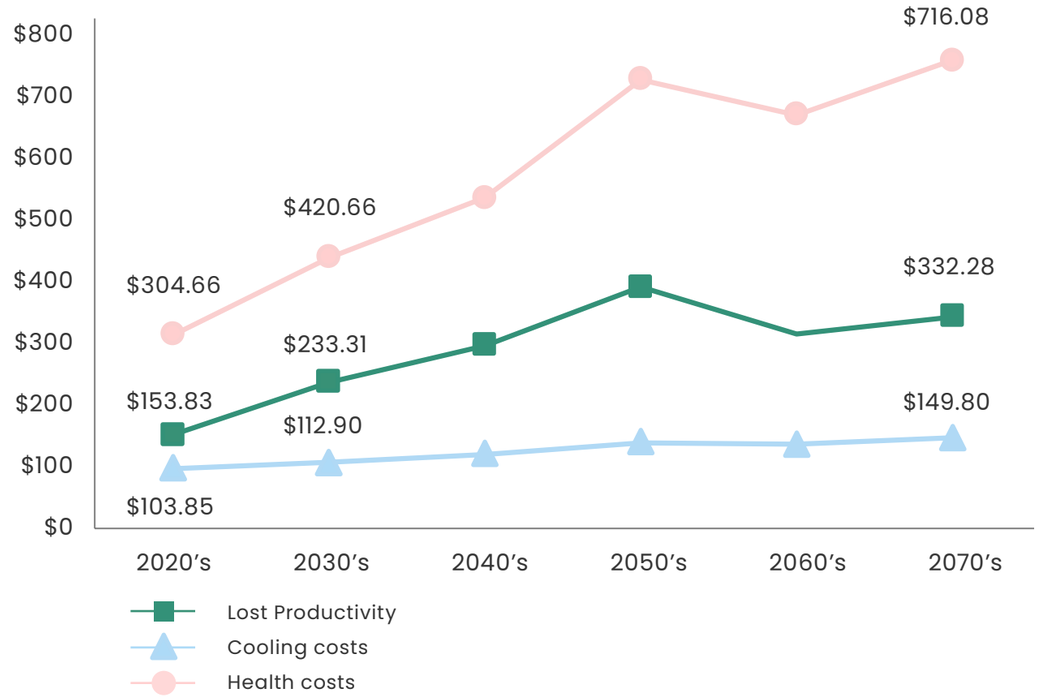
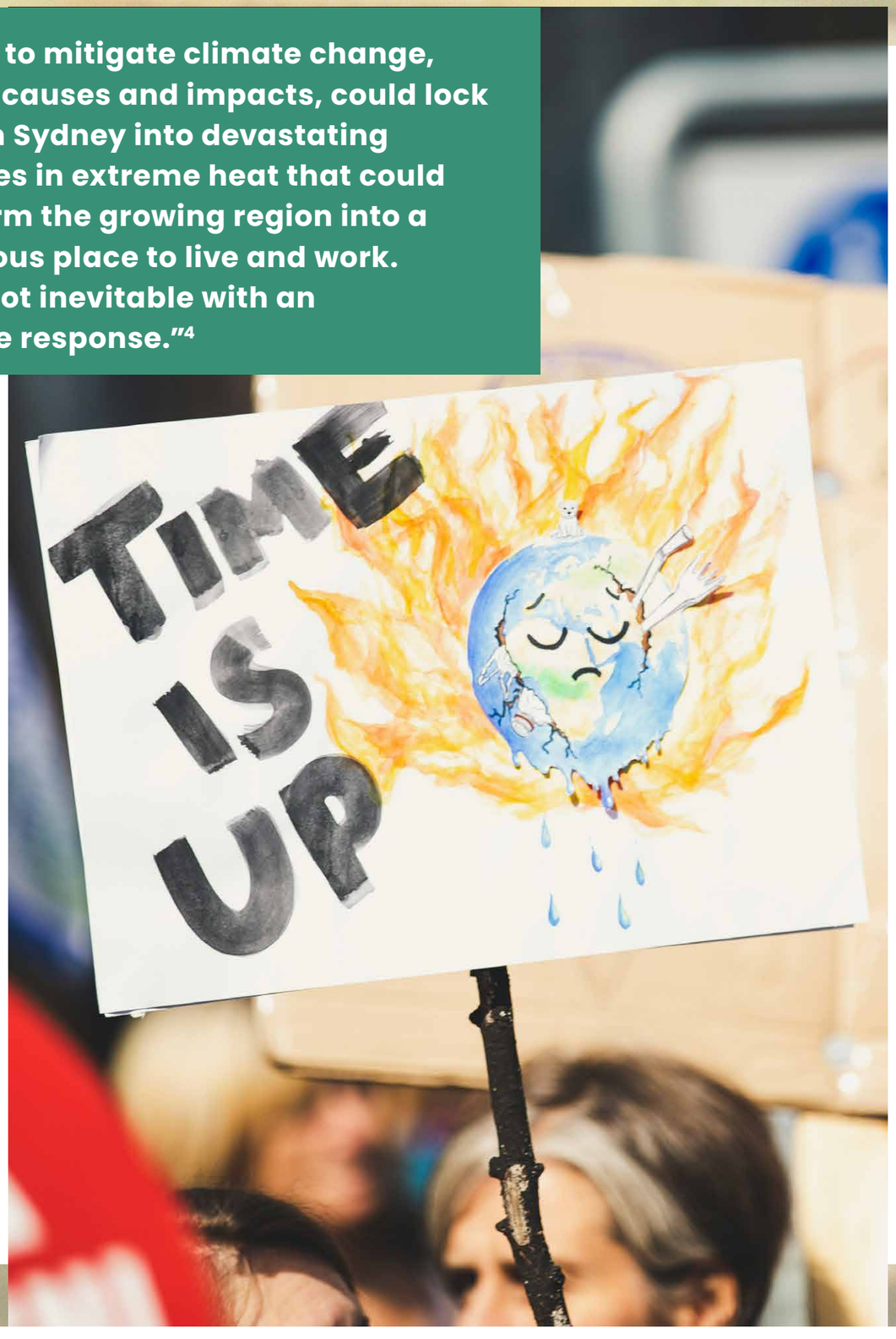


Figure 2 Average Annual Additional Costs per capita, Western Sydney (RCP 4.5, nominal $)



"Failing to mitigate climate change, both its causes and impacts, could lock Western Sydney into devastating increases in extreme heat that could transform the growing region into a dangerous place to live and work. This is not inevitable with an effective response."[4]



As a global community, we have locked in rising temperatures of at least 1.5C and more likely 2C increase in average temperature this century. Mitigating climate change by accelerating the decarbonisation of our city[5] remains top priority. But it is also critical that we prepare communities and businesses in Western Sydney for the heatwaves that are already here and those that will be worse in the future.

Through sharing these findings, Government, industry, and households, can better understand how heatwaves, today and tomorrow, translate to rising costs that will materially impact lives and livelihoods.

Surging costs identified in this report quantify the case for action to reduce the impacts of heat across Western Sydney, targeting first those who are most affected and least able to cope. This means that the NSW Government's approach to preparing for heatwave needs to move beyond coordinated action from the Ministries of Police and Health on heatwave response, and increase attention and action from those whose responsibilities are instrumental for urban heatwave adaptation – NSW Reconstruction Authority, NSW DPHI, InfrastructureNSW, NSW Treasury, and Local Governments across Western Sydney.

The Greater Sydney Heat Taskforce, led by WSROC and Resilient Sydney, has already begun this work. Comprising decision makers from State and Federal Government agencies, local government, industry and the community. The Taskforce will lead the co-design of a coordinated Heat Smart City Plan that will outline measures to reduce risk and build heat resilience across governance, planning and emergency management.

This report is intended to provide an evidence-based quantification of the potential cost of inaction to support investment decisions and the case for change.

Five (5) foundational actions are needed to enable a reduction in the economic impact of heatwaves:

1. **Appoint a lead agency to deliver integrated heatwave adaptation (Now – 2024)**
2. **Integrate heatwave risk into a new Disaster Adaptation Plans across Greater Sydney (Now – 2024)**
3. **Embed the economic costs of heatwaves in the next NSW Intergenerational Report (Next – 2025)**
4. **Explore heatwave insurance options for business and households (Next – 2025)**
5. **Accelerate action on Decarbonising Sydney and NSW (Now – 2024 onwards)**

On the back of the hottest year in living history, it is the time to take further bold, brave and economically astute decisions to reduce the impacts of heatwaves to business and the community today, and to initiate longer-term steps to reduce rising health, household and economic costs.

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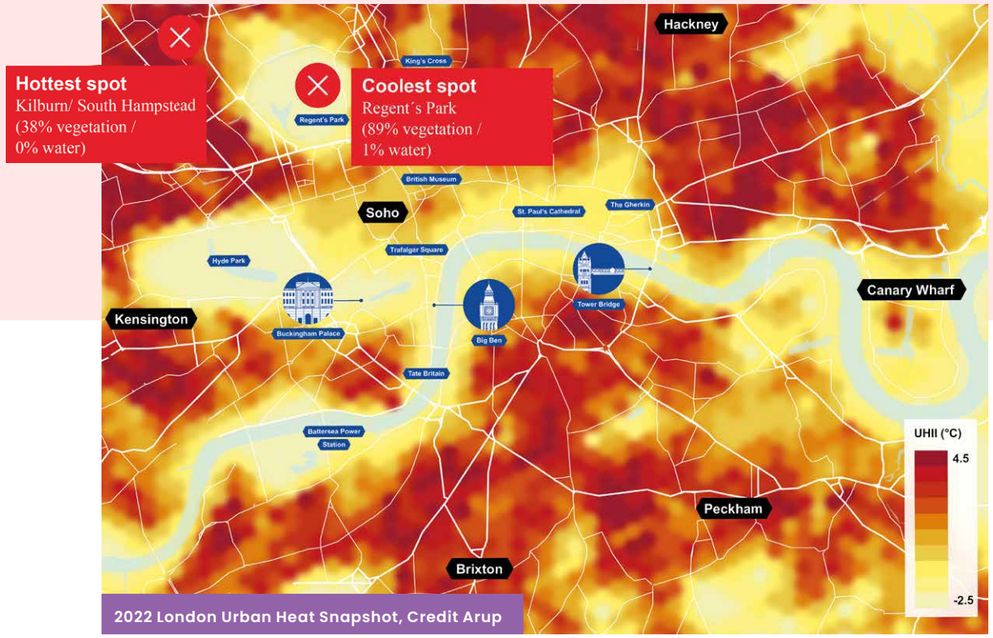
1. Heatwaves will double in frequency and duration over the next 50 years

Globally, 2023 was estimated as one of the hottest years recorded within the last 100,000 years. Global average temperatures were 1.48°C warmer than pre-industrial levels; perilously close to the 2015 Paris Climate Accord threshold of 1.5 °C[6].

2023 was not an outlier. Even a year earlier, in the record-breaking 40°C heat of 2022, schools in London were closed, hospital operations were cancelled as systems crashed and wildfires caused the busiest day for the London Fire Brigade since the Second World War. The heatwaves stretched water supplies, melted road surfaces, caused disruptions to rail infrastructure, and caused widespread failure of green infrastructure (including street trees).[7]

Meanwhile, across large parts of eastern Australia, a rare triple La Nina sequence saw record flooding events and rainfall. The costs were significant with the 2022 East Coast floods having insured costs of $6billion and uninsured costs of $15billion[8].



2022 London Urban Heat Snapshot, Credit Arup

The NSW Government responded to the impacts of the East Coast floods through the establishment of the NSW Reconstruction Authority, with a legislative requirement to prepare a State Disaster Mitigation Plan, and Disaster Adaptation Plans that must include or identify: *"an assessment, and consideration, of the impacts of climate change on disasters"*[9].

The 2024 NSW State Disaster Mitigation Plan (SDMP)[10] identifies the impact of heatwaves across the built environment, people, the economy and the natural environment, and notes the need for a better understanding of heatwaves and the appropriate Statewide actions to manage them. Actions in the SDMP focus specifically on developing a library of standard planning controls for councils to apply, including *"to address the key issue of heatwave, commence with compulsory 'keeping houses cool' planning controls e.g. roof colour".*

The NSW Department of Climate Change, Environment, Energy, and Water (DCCEEW) is also undertaking a climate risk assessment across the State. Section 10 of the Climate Change (Net Zero Future) Act 2023 also establishes an "adaptation objective" of making NSW more resilient to a changing climate, and provides a power to make regulations "about the implementation of the adaptation objective".

There is also a national initiative being led out of the Federal Government - on behalf of all states and territories - on a national risk assessment. This will identify adaptation priorities around the country on a geospatial basis based on a defined set of climate risks overlayed with vulnerability and exposure. This was a finding of the Royal Commission into National Natural Hazards

It is not only flooding that causes significant costs to businesses and the community. We are living in an increasingly volatile environment, with projections from the International Panel on Climate Change (IPCC) indicating that Eastern and Southern Australia will tend towards a hotter and drier climate[11].

On January 4th 2020, Penrith was officially recognised as the hottest place on earth, with micro-loggers recording Penrith suburbs like Berkshire Park at 52˚C, and 51.5˚C in Agnes Banks.

Research[12] shows that heatwaves compound the impacts of climate risks like drought and bushfire, and contribute to a range of negative health, economic, environmental and social impacts. Health impacts include poorer physical and mental health, heat related illness and exacerbated existing conditions.

- Economic impacts include increases in cooling energy costs for households, additional health costs due to heat stress, and productivity loss for agriculture, construction and manufacturing.
- Social impacts include the suspension of community services and activities, school closures, limitations on outdoor sport, and an increase in violent crime[13].

In 2019, in Western Sydney, Parramatta sweltered through 47 days with temperatures over 35˚C and Penrith experienced 44 days over 35˚C that year.[14] On January 4th 2020, Penrith was officially recognised as the hottest place on earth, with micro-loggers recording Penrith suburbs like Berkshire Park at 52˚C, and 51.5˚C in Agnes Banks.[15]

In 2021, NSW Treasury's indicative assessment of climate risk for the 2021 NSW Intergenerational Report found that the increased frequency and intensity of heatwaves will result in 700,000 to 2,7000,000 additional lost workdays by 2061 across agriculture, construction, manufacturing and mining alone[16].

While governments are taking measures to better manage climate-exacerbated disasters, there is still a lack of clarity or specific mechanisms through which to address the economic impacts of heatwaves in the short and long term.

At a local government level, the 2018 Resilient Sydney Strategy[17] identified heat as one of Sydney's top shocks, leading to the development in 2021 of the Heat Smart Resilience Framework by the Western Sydney Regional Organisation of Councils[18]. WSROC created the 'Cool Suburbs Tool'[19] - a voluntary rating and assessment tool for building heat resilience in urban planning.

In the competition between cities to provide liveability and attract talent, having areas with unmanageable heat will encourage people to choose alternative places to live and invest. As the 2006 Stern report into the Economics of Climate Change concluded, 'the benefits of strong and early action far outweigh the economic costs of not acting.'[20]

This report sets out the economic costs of not acting, and the pathway for action to reduce the heatwave related costs to businesses and households.

1.1 Methodology overview

In 2021, NSW Treasury research[21] provided an initial assessment of the impact of heat on workplace productivity, and pointed out the need for this analysis to expand to focus on other impacts like human health.

The data presented in this report is generated through in-house modelling, in order to identify some of the direct costs of heatwaves on households and industry. The analysis in this report does not model the potential compounding climate risks of heat stress, floods and fire.

The overarching method of analysis is summarised as follows:

1. Obtain publicly available climate forecast data from NSW Government Climate Data Portal.
2. Convert into latitude and longitude points to align with key points of Western Sydney to form the basis of the temperature increases used in the costs of climate.
3. Set assumptions relating to the average retail price of electricity, usage, incremental change in cooling use for every degree increase, calculate 'cooling degree days' which is days above the average temperature for a certain month, and household size.
4. Gather population and productivity projections for regions of Sydney from publicly available data sources.
5. Apply the assumed parameters to determine economic impacts.

Assumptions and limitations include:

- Parameter assumptions are generally constants or averages, which may not reflect the changing nature of other factors (e.g. technological developments in energy generation).
- Inherent uncertainty in population and climate forecasts for next 50 years.
- Adopted climate scenario RCP 4.53, which is described by the Intergovernmental Panel on Climate Change (IPCC) as a moderate scenario in which emissions peak around 2040 and then decline.

- Costs and outcomes assume the current state of the world will stay the same for the next 50 years, i.e. no policy intervention
- For presentational purposes, the number of days over 35C in the graphs are averaged over a decade, however the economic modelling relies on the yearly temperature projections.

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

RCP 4.5 is described by the Intergovernmental Panel on Climate Change (IPCC) as a moderate scenario in which emissions peak around 2040 and then decline. This report has made the following findings:

- Under the RCP 4.5 scenario, the volume of heatwaves will more than double from **1.5** in 2010-2019 to **3.6** in 2070-2079.[4]
- The average number of heatwaves days (HWD) per year in Western Sydney will nearly quadruple from almost **6** in 2010-2019 to over **20** in 2070-2079.
- The duration of heatwaves is also expected to get longer, increasing from an average of **6** days in 2010-2019 to **27** days in 2070-2079.
- Western Sydney will also see a doubling in the average number of days per year where the temperature is over 35 degrees, rising from **10** in 2010-2019 to **20** in 2070-2079.

Figure 3 shows continual increases across all the heatwave metrics through to 2079 – the most notable is the longest duration of heatwaves. Figure 4 shows the definition for heatwaves used in this report.

Figure 3 Heatwave metrics across Western Sydney by decade

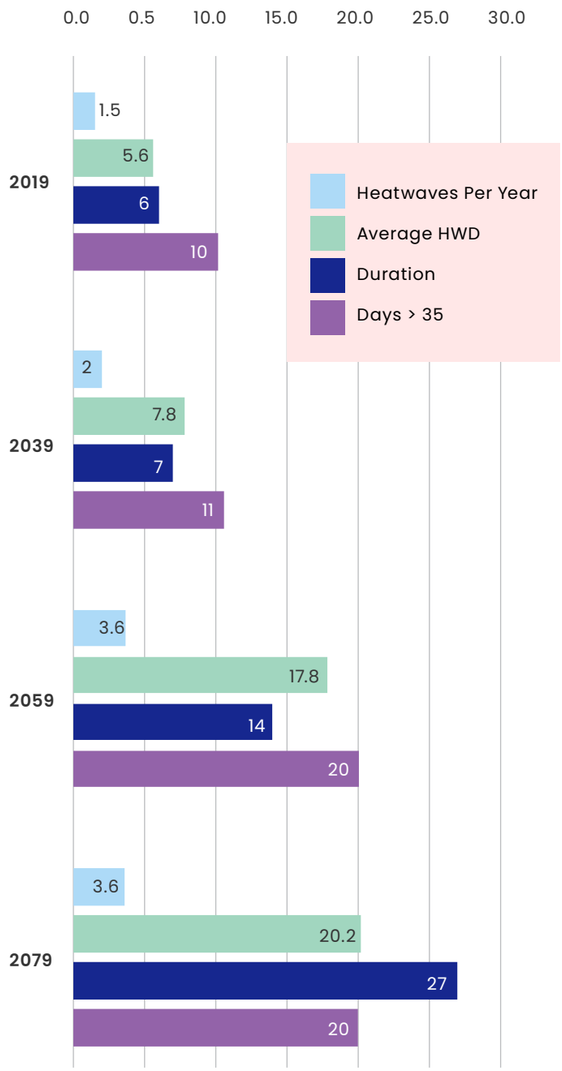


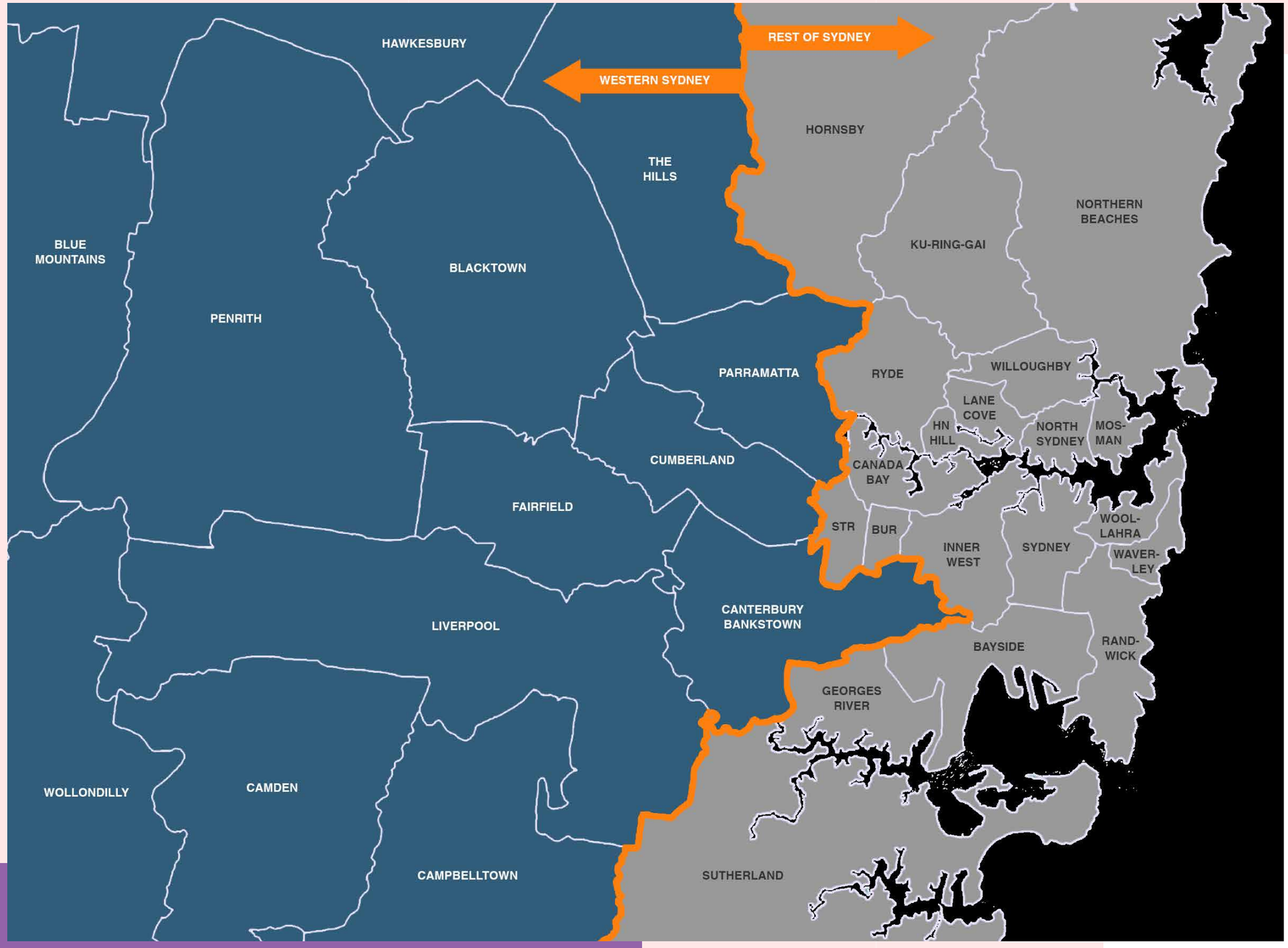
Figure 4 Heatwave definition

- There are a variety of existing methods to estimate heatwaves
- We've selected a definition consistent to the Bureau of Meteorology definition
- Excess heat factor (EHF) is calculated as below:
  - Determine the excess heat signature index which indicates warmth relative to local climate statistics at 95th percentile:
    - $EHI_{SIG}(i) = \frac{T_i+T_{i-1}+T_{i-2}}{3} - T_{95\%}$
    - Where T_i is the mean temperature for day 'i' and ⊠_(95%) is the 95th percentile of temperatures at the location of interest
  - Determine the excess heat acclimatisation index which indicates warmth relative to the past 30 days:
    - $EHI_{ACC}(i) = \frac{T_i+T_{i-1}+T_{i-2}}{3} - \frac{\sum_{k=3}^{32} T_k}{30}$
  - The excess heat factor is a combination of excess heat signature index and excess heat acclimatisation index. If positive, it indicates a heatwave-condition:
    - $EHF(i) = max(EHI_{ACC}(i), 1) \times EHI_{SIG}(i)$

3 By contrast, RCP 8.5 is the highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century

4 Our analysis is based on average temperature being higher than 35 degrees rather than maximum days being higher than 35 degrees. The average is taken across the decade rather a specific year within a decade to avoid introducing unnecessary volatility in the charts. 2020 in our graph represents 2010 – 2019 time period and 2080 in our graph represents 2000-2079 time period.

Figure 5 Map of Western Sydney



Credit: Centre for Western Sydney

Heatwaves are costing Western Sydney's businesses and communities more than $1 billion today, comprising over $650 in additional per capita costs.

1.3 Western Sydney is increasingly at risk from the impacts of heatwaves

Western Sydney (Figure 5) is home to more than 2.7 million people. Its population is projected to reach almost 3.2 million by 2036, absorbing two thirds of Sydney's total population growth.[22]

Western Sydney is increasingly at risk from the impacts of heatwaves due to its geography and rapid urbanisation rates.

Western Sydney is typically 6-10°C hotter than the rest of the city during heatwaves events[23], partly because it is impacted more by hot westerly winds and not cooled by coastal breezes[24]. But it is not that simple.

To date, there has been insufficient data to weigh up the cost benefit of investment in thermal comfort in the design of the houses, suburbs and infrastructure, removing green cover, and increasing grey concrete and black bitumen and roof tiles, which keep our suburbs from cooling down at night, magnifying the impact of heatwaves.

This report shows that heatwaves are costing Western Sydney's businesses and communities more than $1 billion today, comprising over $650 in additional per capita costs. All three components of these per capita costs (productivity losses, health costs, and costs of household cooling) will increase over the next 50+ years.

As the population grows, decisions about where and how to build residential, commercial and industrial areas will influence the extent to which communities and businesses can cope with increased heatwaves.

2. Heatwaves will bring rising costs to the economy and community

Over the remainder of the century, the population exposed to heatwaves will dramatically increase, rising from 14 million people days to over 100 million people days in 2079. ^[1]'People days' means the number of people affected by the heatwave multiplied by heatwave days.

2.1 The health and economic burden of climate change will rise to over 100 million people days

Over the remainder of the century, the population exposed to heatwaves will dramatically increase, rising from 14 million people days to over 100 million people days in 2079. ^[5]'People days' means the number of people affected by the heatwave multiplied by heatwave days.

The dramatic increase in people days (nearly 700%) and associated negative health impacts is attributable to two key factors - increasing population and increasing number of heatwaves.

The vulnerable age cohort[6]* of Western Sydney residents exposed to the health impacts of increased heat stress rises from 3 million in 2020 to 23 million people days by 2079.

The vulnerable income cohort[7]** of Western Sydney residents exposed to the economic impacts of climate change rises from 6 million in 2020 to 43 million people days by 2079, highlighting the productivity and lost income costs that are associated with a warming climate.

Figure 6 Economic quantification approach: Health systems strain and increased morbidity

Rationale:
Heat-related illnesses include rash, cramps, dizziness, heat exhaustion and heatstroke. Extreme heat is stated to kill more Australians than any natural disaster with heatstroke fatal in up to 80 per cent of cases. In Sydney, heatwaves are associated with substantial increases in mortality and heatwave related death is expected to increase dramatically over time.

Key parameters:

- $2.90 per peak temperature degree over 30, per person.
- Includes value of statistical life, cost of admitted emergency department presentations and ambulance costs.

Source:
NSW Government Interim Framework for Valuing Green Infrastructure and Public Spaces, NSW Government Population Projections.

Based on Office of Best Practice Regulation; Independent Hospital Pricing Authority, and NSW Ambulance fees and charges.

5 ^Exposure has been defined as people multiplied by heatwave days per year.
6 *Vulnerable cohort (age) refers to the population aged 0 -14 and 70+.
7 **Vulnerable income cohort refers to those who earn below the national median income (less than $52k p.a.)

Figure 7 shows collective heat wave days experienced by the Western Sydney population based on RCP 4.5 – highlighting the multiplicative effect that increasing temperatures and an increasing population has on the power grid, economy and health of the population.

"Energy consumption for cooling purposes in Western Sydney is up to 100% higher than in eastern zones of the city"[25]

Figure 7 Collective heatwave days experienced by Western Sydney population (RCP 4.5)

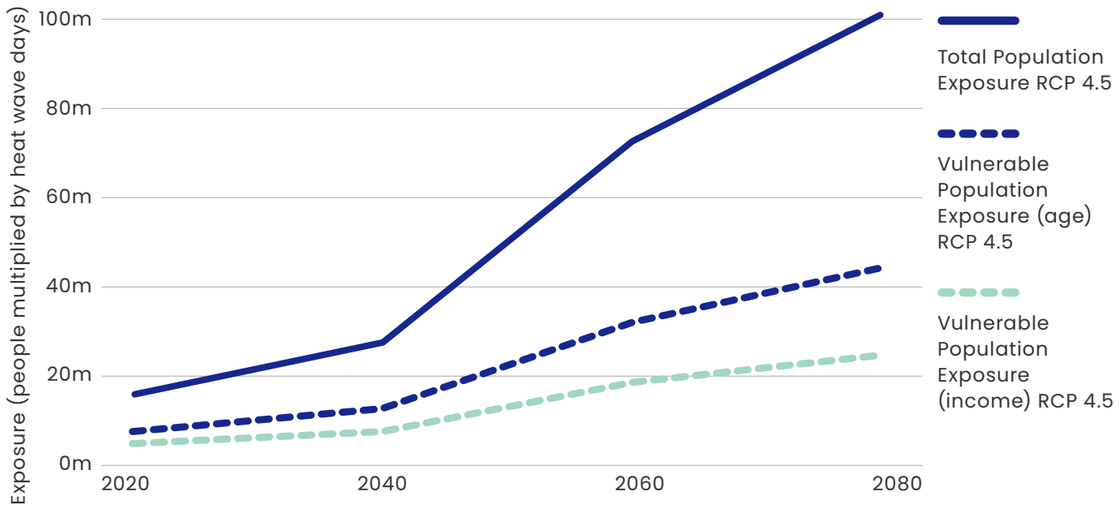


Figure 8 Economic quantification approach: Increased residential cooling

Rationale:
On hot days, the demand on the grid is increased. This results in cost increases from greater electricity demand. Residential cooling is quantified given households are more likely to respond through increasing cooling. There is a lack of data indicating how commercial operators respond to heat, and subsequently the impact on electricity demand.

Key parameters:

- $0.51 per Cooling Degree Day.
- Based on $0.30 per kwh, 0.038% increase in energy use per CDD, average annual household of 4,500 kwh per annum.
- 2.7, average household size in Greater Sydney, 2021

Source:
NSW Government Interim Framework for Valuing Green Infrastructure and Public Spaces.

Based on AEMO model of electricity demand.
2021 Census

2.2 The cost of cooling Western Sydney households is estimated to increase 370%

In 2023, the cost of cooling residential households in Western Sydney was estimated to be $255 million. In 2079, it could be $950 million[8].

The cost of heat-related health impacts follows the same trend, increasing from $637 million in 2023 to $5.3 billion in 2079, an 800% increase, due to the increase in days over 30°C.[9]

The estimated cost of cooling will increase on a linear trend, meaning every single year the cost of cooling will increase at approximately the same magnitude as the last.

8 The monetised value of health per person for every day above 30 degrees has been set at $2.90 as at 2022 (NSW DPIE). Similarly, the monetised value for cooling has been set as the product of the price of electricity (DPIE 2022), household usage (DPIE 2022), and the marginal increase of cooling use given days that need cooling (AEMO 2015).

9 The monetised value of both health and cooling has been kept constant for all years in the analysis. Note in the future these could be valued higher as the population might place a greater value on health and keeping dwellings cool as the temperature and heatwaves increase.

In the years following 2041, the cost of health is estimated to increase faster than the period 2021 to 2041. This is driven by many factors such as forecasting variance, worsening climate conditions and increasing costs of healthcare.

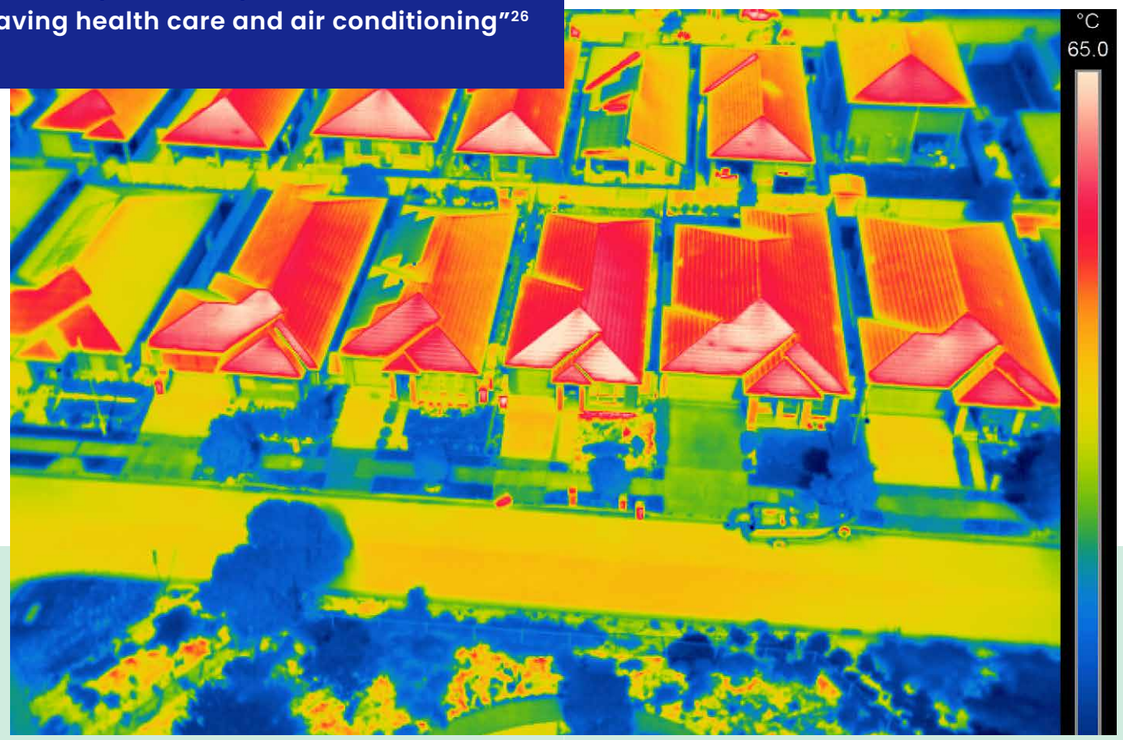
The equity dimension is clear here. For those who can afford to access rooftop solar and battery storage, the costs of household cooling are significantly lower compared to those who are not able to afford, or are excluded from, the benefits of decentralised energy.

"The effects of heat amplify and reflect preexisting inequalities in health, housing, income, and occupational safety—as these disparities impact access to life-saving health care and air conditioning"[26]

In today's dollars, the cooling component of energy bills would increase, on average, $3 every year. In years of warmer weather, the year-on-year increase could be more, and similarly, in cooler years it could be less. Today, the cost of cooling is around $258 per year, and is expected to increase to $421 per year in 2079 (using the value of today's dollar).

Figure 9 shows the cost of cooling under the RCP 4.5 scenario, and in today's dollars (i.e. not accounting for inflation) will continue to increase each year – from $255 million in 2023 to $950 million in 2079.

Figure 10 shows the health costs under the RCP 4.5 scenario in today's dollars (not adjusted for inflation) will continue to increase each year – from $637 million in 2023 to $5.3 billion in 2079.



Credit: S. Pfautsch

Figure 9 Cost of Cooling for Western Sydney regions (RCP 4.5, nominal $)

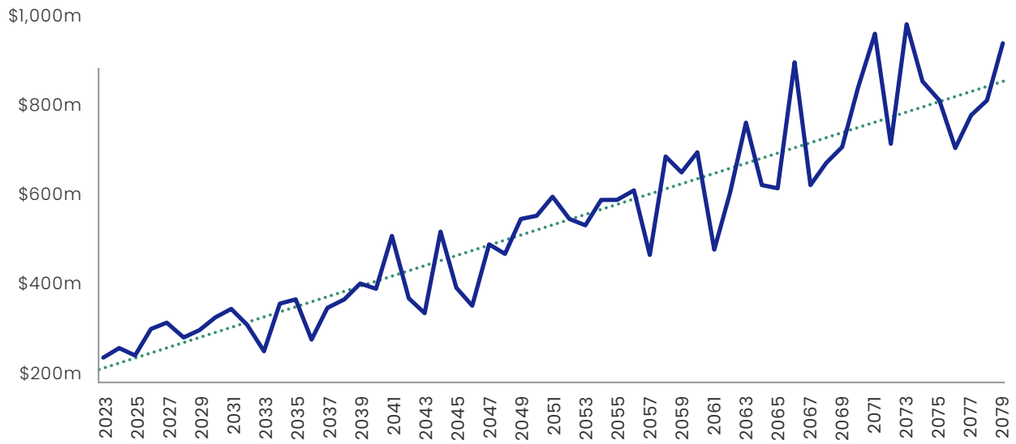
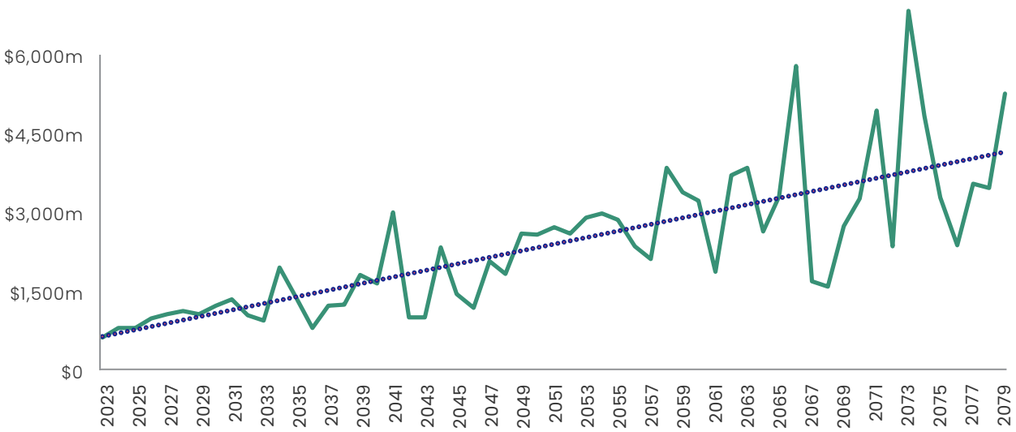


Figure 10 Health Costs for days over 30C for all persons in a region, (RCP 4.5, nominal $)



As temperatures reach 32C [outdoor worker] productivity drops by about 25%, and it falls by 70% as temperatures reach 38C. As temperatures reach 32C productivity drops by about 25%, and it falls by 70% as temperatures reach 38C.[28]

Figure 11 Economic quantification approach: Lost economic productivity

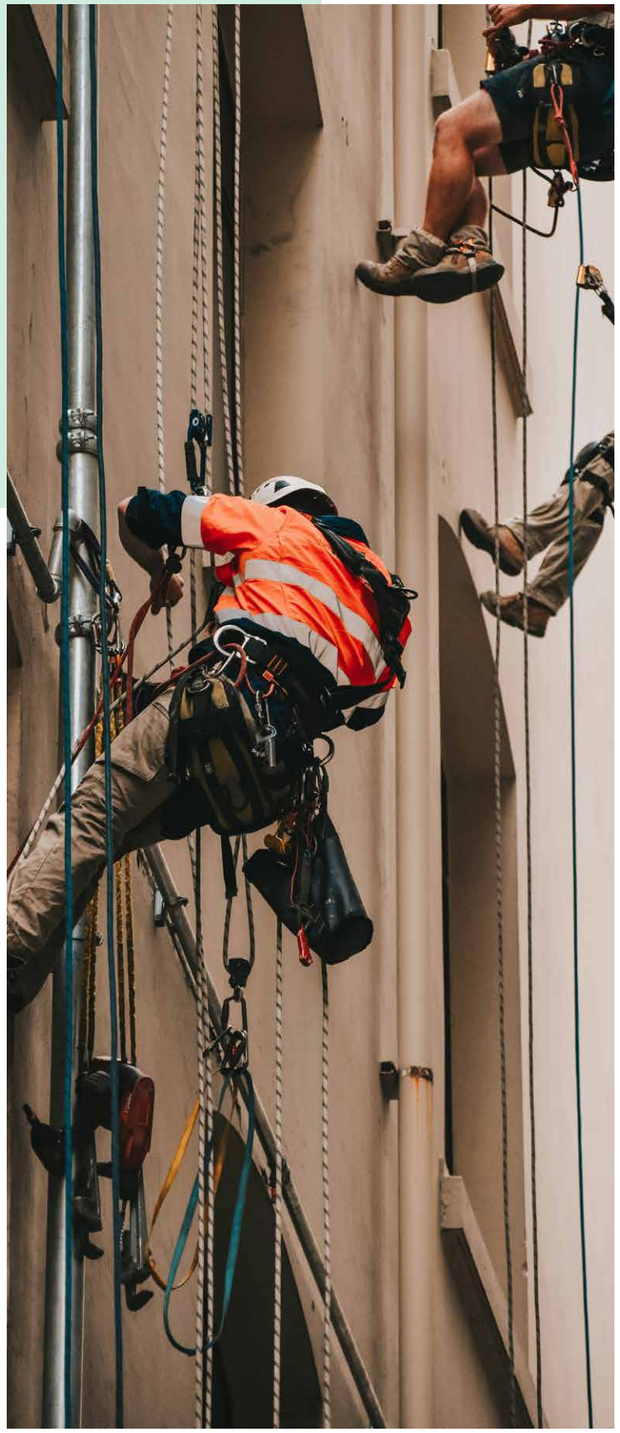
Rationale:
Extreme weather may have many impacts on economic productivity. Most directly, it can prevent work in exposed industries, where workers need to work outside.

Key parameters:

- **Productivity loss impacts agriculture, construction, manufacturing and mining.**
- **Moderate (15%) productivity loss is assumed to occur where maximum daytime temperatures exceed 32°C, with higher productivity loss (30%) on days where maximum temperatures exceed 35°C.**

Source:
NSW Government Interim Framework for Valuing Green Infrastructure and Public Spaces, NSW Government Population Projections.

Based on Office of Best Practice Regulation; Independent Hospital Pricing Authority, and NSW Ambulance fees and charges.



2.3 Annual losses to the Western Sydney economy will reach $1.5 billion

An increase in temperatures and more frequent heatwaves will impact workforce productivity.

Place of work data from the 2021 Census[27] shows that out of all the people who listed 'labourers, machinery operators and drivers, and technicians and trade workers' as their occupation, 55% listed their place of work as being located in Western Sydney. This means just over half of the element-exposed labour was performed by people working in Western Sydney.

Heatwaves and the number of days above 30°C are forecasted to increase yearly, which will continuously reduce Western Sydney's ability to keep its productivity at 2023 levels.

In 2023, the estimated annual productivity loss was $423 million and could climb to around $2 billion by 2079, a loss of more than $1.57billion or an increase in productivity losses of 470%.

This means that by 2079, the increase in temperature will reduce 1.7% of potential value added to the Western Sydney economy compared to 0.8% in 2023.

In the future there will be more element-exposed workers in Western Sydney because that is where the bulk of the new infrastructure (i.e. growth areas) will be.

Figure 12 shows the annual productivity loss for Western Sydney climbing each year from both a dollar and proportional perspective, resulting in a greater amount of lost value added to the economy. By 2079, the productivity loss is around $2 billion.

Figure 13 (following page) shows that by 2079, the productivity loss equates to reducing around 1.7% of the value added to the economy. I.e. If current climate conditions stayed the same in 2079 as today, there would only be a 0.8% loss in value added but instead there is 0.9 percentage points more (1.7%).

Figure 12 Annual Productivity loss for Western Sydney (RCP 4.5, nominal, $)

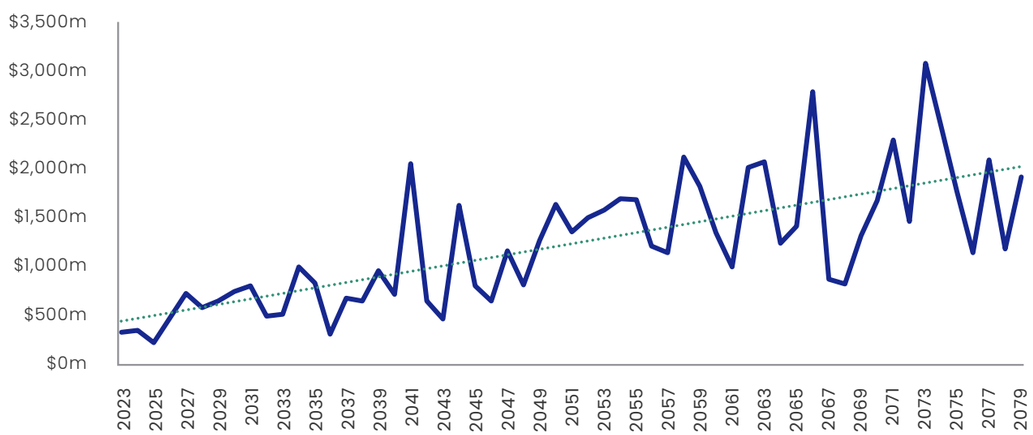
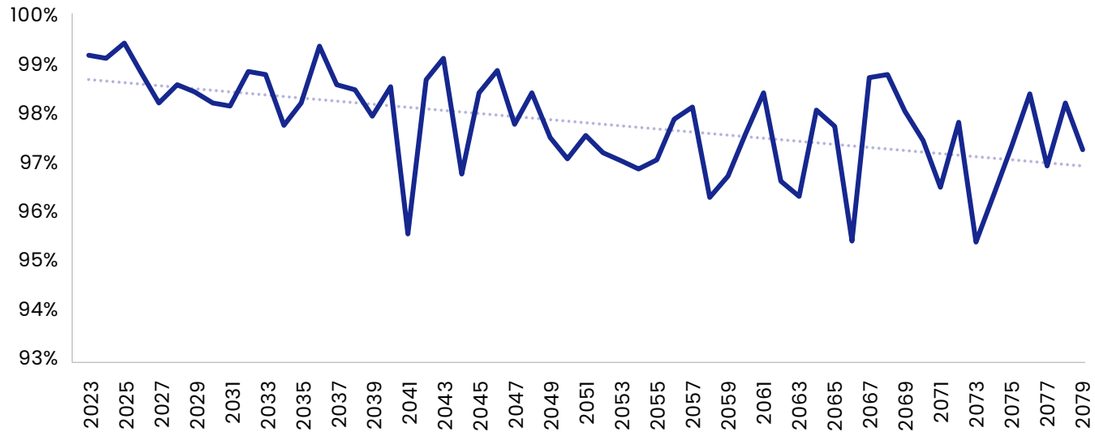


Figure 13 Annual cumulative productivity loss, Western Sydney average (%), (RCP 4.5)



2.4 Heatwaves will increase annual costs to business and the community to $6.8 billion

As Western Sydney gets hotter and experiences more and longer heatwaves over time, cooling, health and lost productivity costs will rise significantly.

By 2080 we will see increased health costs (up 135% on 2020 levels), productivity losses increase (116% higher than 2020 levels) and energy costs rise (up 44% on 2020 levels). [10]

At an aggregate level, the annual costs Western Sydney experiences as a result of climate change increases 400% from $1.4 billion today, to more than $6.8 billion by 2079. The greatest increase can be attributed to health costs, increasing from $305 in the 2020's to $716 in the 2070's.

More than half of this total is attributed to the health costs experienced by a larger and older population, with cooling costs (13%) and lost productivity (28%) comprising the remainder of the burden experienced by Western Sydney residents.

10 Source: Scyne Advisory modelling of publicly available data from the ABS, TfNSW, NSW Government DPHI and AEMO

Figure 14 shows all three components of costs per capita associated with heatwaves will increase over the next 50+ years.

Figure 15 shows the breakdown of annual cost per year associated with heatwaves – the largest portion has always been attributed to health costs and that proportion continues to grow over time.

Figure 14 Average Annual Additional Costs per capita, Western Sydney (RCP 4.5, nominal $)

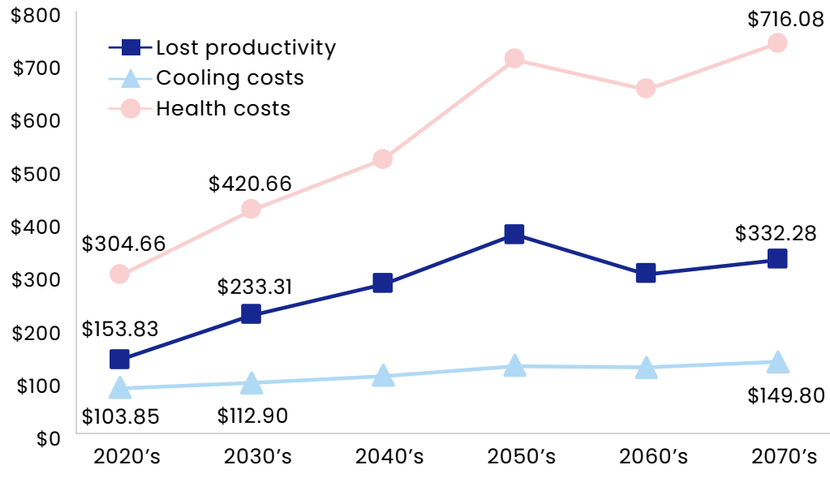
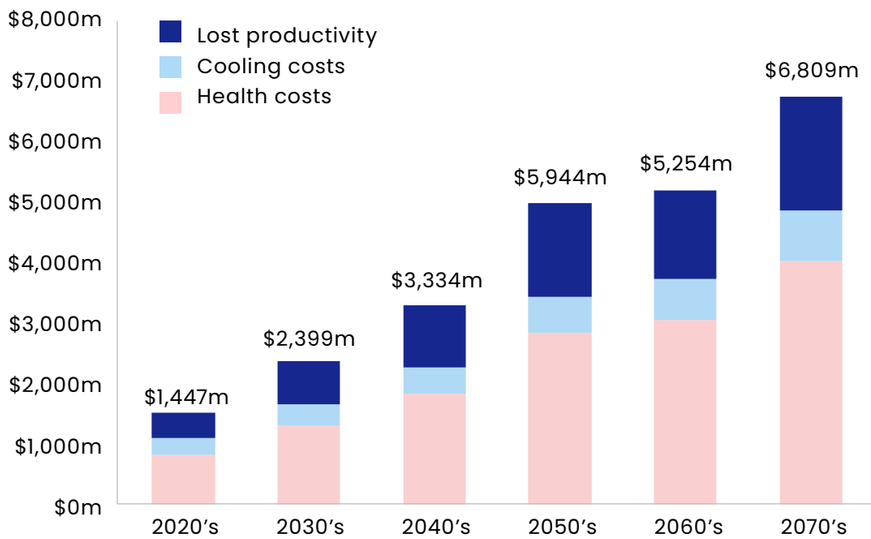


Figure 15 Average annual cost, Western Sydney (RCP 4.5, nominal, $m).



3. Reducing the costs of Heatwaves in Western Sydney

Western Sydney Heat Taskforce Image Credit: WSROC

Heatwaves are costing Western Sydney's businesses and communities more than $1 billion today. These costs are projected to become significantly worse as heatwaves events become more frequent and intense. The burden of these costs will not fall equally across Western Sydney, and will be borne by households, businesses and government alike.

On the back of the hottest year in living history, the case for change is clear.

The growing costs identified in this report quantify the case for action to reduce the impacts of heat across Western Sydney, targeting first those who are most affected and least able to cope.

This report identifies the need for a coordinated response, from Government, business and the community, that urgently confronts the economic impact of heatwaves on business and the community.

Five (5) foundational actions are needed to enable Western Sydney businesses and households to confront the rising costs of heatwaves:

1. Appoint a lead agency to deliver integrated heatwave adaptation (Now – 2024)
2. Integrate heatwave risk into a new Disaster Adaptation Plans across Greater Sydney (Now – 2024)
3. Embed the economic costs of heatwaves in the next NSW Intergenerational Report (Next – 2025)
4. Explore heatwave insurance options for business and households (Next – 2025)
5. Accelerate action on Decarbonising Sydney and NSW (Now – 2024 onwards)

The Issue	Recommended Actions	Responsibility
1.1 Appoint a lead agency to deliver integrated heatwave adaptation (Now – 2024)		
No single agency has whole of government remit to coordinate and lead heatwave adaptation across building codes, land use planning, critical infrastructure resilience, and business and utility continuity. The 2024 State Disaster Management Plan identifies the need for collaborative governance across Government to build trusted relationships with business and the community, and allocate responsibilities for reducing heatwave and other risks in Western Sydney.	a. Identify a lead agency at NSW Government level to convene and collaborate across Government, and with industry and the community, to drive economic and health preparedness, and consider opportunities to adapt to rising heatwaves, including infrastructure, and existing and new or planned developments.	**Proposed Lead:** NSW Reconstruction Authority **Key Collaborators:** • NSW Health • NSW Police • NSW Department of Planning, Housing and Infrastructure • NSW Treasury • NSW Department of Climate Change, Energy, Environment and Water • Infrastructure NSW • NSW Office of Chief Data Scientist • Greater Sydney Heat Taskforce
1.2 Integrate heatwave risk into Disaster Adaptation Plans across Greater Sydney (Now – 2024)		
Currently no plan exists for a coordinated approach to heatwave preparedness and adaptation, that considers the growing economic impact on households, businesses and service providers. Heatwaves are costing businesses today, by constraining outdoor operations and maintenance, across utility, retail, construction and logistics sectors. We need to understand the extent of these direct impacts, and how the expected flow on effects of extended heatwaves would impact the city and economy.	a. Develop heatwave focussed guidelines for inclusion in the Disaster Adaptation Plan Guidelines and Framework. b. Prepare a heatwave responsive Disaster Adaptation Plan for Greater Sydney to enable Government, industry and the community, to drive business, household and service provider preparedness. c. Identify the cascading impacts of infrastructure disruption on business (e.g. prolonged loss of power on operations, total fire bans on welding, road/ rail buckling on supply chains), and the potential flow on effects to the community, service providers and other businesses. d. Develop a consolidated package of policies, investments and actions at local and regional level that identify, support and monitor the most vulnerable communities and businesses to cope, adapt and thrive in a changing climate. e. Include heatwave risk as a key driver of planning and design of new development in local and metropolitan planning (including the 6 Cities and Transit Oriented Development plans for Greater Sydney. f. Analyse the costs and benefits of heatwave adaptation actions across vulnerable or front-line sectors including health, construction and manufacturing.	**Proposed Lead:** NSW Reconstruction Authority **Key Collaborators:** • Greater Sydney Heat Taskforce • WSROC/ Resilient Sydney • Local Government • NSW Health • NSW Department of Climate Change, Energy, Environment and Water • NSW Department of Planning, Housing and Infrastructure • NSW Treasury • Universities • Utilities • Business NSW • Service NSW Business Bureau • Commonwealth Department of Climate Change, Energy, Environment and Water • National Emergency Management Authority

The Issue	Recommended Actions	Responsibility
1.3 Embed the economic costs of heatwaves in the next NSW Intergenerational Report (Next – 2025)		
Heatwave risk is currently missing from the Intergenerational Reporting framework. As the economic costs from heatwave and other climate risks become more defined, there is an opportunity to bring growing costs to business and households into NSW Treasury reporting frameworks to highlight the case for investment in adaptation.	a. Embed the impacts and economic costs of heatwaves into NSW Government decision making, including through the 2026 NSW Intergenerational Report (aggregate risk), and biennial departmental climate change impacts, risks and adaptation statements (enterprise risk disclosure)	**Proposed Lead:** NSW Treasury **Key Collaborators:** • NSW Department of Climate Change, Energy, Environment and Water • NSW Reconstruction Authority • NSW Department of Planning, Housing and Infrastructure • NSW Health
1.4 Explore heatwave insurance options for business and households (Next – 2025)		
The growing financial impacts of heatwaves on households and businesses is building the case for enabling access to insurance products to minimise economic losses.	a. Explore options available to minimise heatwave risk to the economy, including insurance options to reduce the financial risk to business	**Proposed Lead:** NSW Reconstruction Authority **Key Collaborators:** • Service NSW Business Bureau • Insurance Council of Australia • Swiss Re • Bureau of Meteorology
1.5 Accelerate action on Decarbonising Sydney and NSW (Now – 2024 onwards)		
The only way to mitigate climate changes that are driving the increased frequency and intensity of heatwaves is to accelerate decarbonisation of our city, and state, to limit to scale of global heating and related local impacts.	a. Implement in full the recommendations of Committee for Sydney report 'Decarbonising Sydney'[29] in order to drive Greater Sydney towards meeting accelerated net zero goals, including: • Convert all state and local government fleets to EVs by 2030 • Support vulnerable households to reduce energy costs through access to rooftop solar, battery storage and more efficient household appliances (heat pump hot water). • Introduce a 2030 modal shift target of 40% with supporting policies and programs to encourage increased active travel, public transport use, car sharing etc. • Set a target and roadmap for battery storage adoption in Greater Sydney to reach ~2.7 GWhs by 2030.	**Proposed Lead:** NSW Department of Climate Change, Energy, Environment and Water **Key Collaborators:** • NSW Treasury • NSW Department of Planning, Housing and Infrastructure • Local Governments

Appendix A: Methodology

Quantifying the impact

Below are the three stages applied in this report to quantifying the impact of heat stress over the next 60 years:

Stage 1

Understand and obtain temperature projections

- Obtained external datasets from NSW Government Climate Data Portal for temperature projections
- Used Transport for NSW data for population projections by age and gender demographics
- Sense checked and analysed data
- Projected population and temperatures for Western Sydney regions to 2079

Stage 2

Calculate heatwaves projections under different scenarios

- Utilised the Excess Heat Factor definition to calculate projected heatwaves in the future
- Heatwaves were calculated under different scenarios and for different regions within Western Sydney
- Population data was overlayed to account for the impact of heatwaves on vulnerable people

Stage 3

Quantify economic, health and social impact

- Defined temperature contributors to health costs, cooling costs and productivity loss on credible methodology
- Projected cost impacts across Western Sydney under the delayed intervention scenario
- Overlayed impact of demographic shifts over the time horizon

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Our Resilience Program Partners are leaders in their respective fields, embracing the transition to a decarbonised future, and adapting to a changing climate.

The Resilience Program focuses on:

- Identifying opportunities for innovation and economic growth for business, government, and the community in the transition to net zero.
- Determining where and how we invest to ensure system-level resilience and reduce impacts on businesses and communities.
- Building on experience of extreme heat, flood, storms, and fires to reduce direct risks to life, assets and productivity, now and into the future.

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