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Navigating extreme heat in Australia

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Extreme heatwaves – three or more days in a row where both daytime and night-time temperatures are unusually high – pose significant threats to communities across Australia. The risk posed by extreme heat touches almost every facet of life – impacting people, productivity, assets, services, infrastructure and quality of life. Increasing temperatures will require that organisations and communities work to plan, prepare, adapt and respond to a new set of challenges that put people's health, safety and wellbeing, as well as organisational continuity, at risk.

Globally, the temperature increase has reached 1.09ºC above the pre-industrial average (IPPC AR6) with the increase over land being more pronounced reaching 1.59ºC. It is projected that if the current policies do not become more ambitious the warming will reach 2.8ºC by the end of this century.

The Bureau of Meteorology has confirmed that El Niño will be active in Australia over the summer of 2023/24. Combined with a positive Indian Ocean Dipole, this is likely to lead to more intense heatwaves, severe bushfires and worsening drought conditions in certain areas of Australia. Overall, meteorologists predict that the summer of 2023/24 will be the hottest on record in Australia.

This is becoming evident as scientists state that 2023 is very likely to become the hottest year on record for the planet (since records began in 1850). In fact, the global mean temperature for the first 10 months of this year has reached a record high, measuring 1.43°C above the pre-industrial average (1850–1900). This is 0.1°C higher than the corresponding 10-month average in 2016, which was previously categorised as the warmest year on record.

ClimaSens's assessment reveals a troubling landscape where almost half of Australia's entire population is at very high to hazardous risk from the heat. Over 10 million Australians currently dwell in 82 local governments classified by ClimaSens as 'hazardous or very high' for heat-related risks (based on ABS 2021 Census Data). This means approximately 38% of the entire population (combining both 'hazardous' and 'very high' risk categories) are at significant risk from heat-related hazards. These figures were compiled by analysing national heat hazard information, social vulnerability and demographic data.

Increasing frequency and severity of heatwaves can contribute to chronic disease such as cardiovascular diseases, asthma and diabetes,[1] heat stress incidents, as well as overall wellbeing such as loss of sleep and fatigue.[2]

The responsibility for planning, preparing for, and responding to these risks falls on multiple shoulders. Government authorities, industry, and non-government organisations (NGOs) all play essential roles in safeguarding communities from extreme heat events, with a particular focus on protecting vulnerable populations.

Responding to heat-related risks require both immediate actions to navigate the upcoming summer as well as ongoing strategies to build long-term climate resilience. Doing so will require rigorous planning to understand the present and future risks that heat-related events pose.

1 S. Wang, W. Cai, et al, Nexus of heat-vulnerable chronic diseases and heatwave mediated through tri-environmental interactions: A nationwide fine-grained study in Australia, Journal of Environmental Management, Volume 325, Part B, 2023, 116663

2 K. Zander, S. Mathew, S. Carter, Behavioural (Mal)Adaptation to Extreme Heat in Australia: Implications for Health and Wellbeing, 6 June 2023

Top impacts of extreme heat

03

1. **Silent killer**
   Globally, nearly five times more people will likely die by 2050[3] due to extreme heat under a scenario where the world warms by 2.7°C. Health experts say billions of people are at risk of preventable death and illness from exposure to extreme heat, which can result in heat stroke, kidney failure, or exacerbate heart or respiratory diseases, among other health problems.[4]

2. **Power grid pressure**
   Residential electricity use can be three to four times higher than normal on days that are 35°C or hotter, placing stress on the power grid and increasing the risk of blackouts or power shortages.

3. **Inefficient power transmission**
   Heatwaves exert significant pressure on the power grid as high temperatures not only escalate demand but also impact crucial electrical infrastructure. Under hot conditions, generators, transformers, transmission lines, and even solar panels and wind turbines experience reduced efficiency, resulting in lower energy supply to the system. As transmission lines become hotter, their ability to safely carry electricity diminishes, with projections indicating a potential reduction of 7% in Australia's transmission line capacity by 2080 under RCP 8.5 model.[5]

4. **Infrastructure**
   With current roads and transport designed for specific climates, extreme heat places significant risk to infrastructure. The intense heat can lead to road buckling and pavement cracking, causing damage to rail tracks, bridges, and power cables for railways and streetcars. During Australia's 2018 heatwave, parts of the Hume Highway melted,[6] and in 2013, Melbourne's Metro train service cancelled 48 services on the first day of summer due to heat-related speed restrictions once temperatures hit 40°C.[7]

3 News Wires, Extreme heat will likely kill nearly five times more people by 2050, France24.com, 15 November 2023
4 A. Moloney, How 'chief heat officers' keep cities cool as the world warms, Reuters, 10 November 2022
5 ESCI project, The impact of climate change on transmission line ratings, [PDF], accessed 27 November 2027
6 L. Cheer, Traffic delays after 10 kilometres of Victoria's Hume Freeway melts, SBS News, 5 January 2018
7 A. Carey, Why our rails can't cope with the heat, The Age, 18 December 2013

5. **Pressure on healthcare**
   Victoria's Department of Health found the 2014 heatwave resulted in a 7% increase in public hospital emergency visits and a 25% increase in ambulance emergency callouts.[8] These increases strain an already resource-challenged healthcare system where staffing, bed availability and ambulance services struggle to meet current demands.

6. **Workforce**
   By 2030, 2% of total working hours worldwide will be lost every year[9] as high heat makes working more difficult. This impact will not be limited to outdoor occupations such as agriculture and construction but will also extend to indoor industries like manufacturing and transportation, where work environments lack cooling. Heatwaves cause fatigue, leading to increased workplace safety risks and accidents.

7. **Economy**
   Heatwaves are expected to cost $179 million per year by 2030 in Victoria, with regional economies that have a high dependency on the agriculture sector most vulnerable as higher temperatures can severely affect agricultural yields. Studies estimate that each 1°C increase in global mean temperature could see reductions in global yields of wheat (6%), rice (3.2%), and maize (3.2%). Extreme heat also leads to increased livestock morbidity, lower fertility, and reduced resilience to disease.[10]

8. **Buildings**
   Intense heat can cause damage to building materials: metals rust, steel and iron beams expand and adhesives crack, exposing buildings to leaks and structural vulnerabilities. With the growing demand for cooling, buildings will become more energy-intensive as people seek relief from the heat, potentially contributing to increased GHG emissions.

9. **Socio-economic vulnerabilities**
   Research has found that more than 60% of deaths during heatwaves between 2001 and 2018 were in the most disadvantaged areas of Australia.[11] Inequalities such as worse personal health outcomes, lower housing standards, lack of tree cover and limited access to amenities like libraries and transport along side reduced access to air-conditioning or the ability to afford to run it during extreme heat events, lead to increased risk.

"The changing climate is an important challenge for us all. Increased global temperatures are now impacting the way we live and work, particularly in the vulnerable parts of society. All organisations – Government, Corporate and Not for Profit – will need to plan, prepare and adapt to ensure the safety of their communities and continuity of their business into the future."

LUKE HEINE
Director, Local Government Lead, Climate Resilience

8 Doctors for the Environment Australia, Heatwaves and health in Australia, [PDF], accessed 27 November 2023
9 International Labour Organization, Working on a warmer planet: The impact of heat stress on labour productivity and decent work, [PDF], accessed 27 November 2023
10 K. Milliken, Addressing Destabilizing Impacts of Extreme Heat on Global Food Security, International Institute for Sustainable Development, SDG Knowledge Hub, 17 May 2023
11 Risk Frontiers, Heatwave fatalities in Australia: a new analysis, Newsletter Volume 20, Issue 3 – Article 1, accessed 27 November 2023

03

Counting the cost of extreme heat

According to ClimaSens data

38%

of Australia's population is at high to hazardous risk from the heat.[12]

According to the 2023 ACOSS Heat Survey, heatwaves were responsible for

36,000

deaths between 2006 and 2017 in Australia.[13]

By 2030

2%

of total working hours worldwide will be lost every year as increased heat makes working more difficult.[14]

Rising temperatures are forecast to cost Australia

$19b

by 2030 and $211 billion by 2050 in lost agricultural and labour productivity.[15]

12 ClimaSens [link needed]
13 Australian Council of Social Service, ACOSS 2023 Heat Survey: How hotter days affect people on lowest incomes first, worst and hardest, [PDF], accessed 27 November 2023
14 International Labour Organization, Working on a warmer planet: The impact of heat stress on labour productivity and decent work, [PDF], accessed 27 November 2023
15 Climate Council, Compound costs: How climate change is damaging Australia's economy, [PDF], accessed 27 November 2023

Managing People Impacts

04

Context

Extreme heat is the cause of most weather-related hospitalisations, with recent research from The Australian Institute of Health and Welfare finding that 78% of weather-related hospitalisations and more than 43% of extreme weather-related deaths were due to extreme heat.[16]

Exposure to prolonged or severe natural heat can result in physical conditions ranging from mild heatstroke symptoms to death. Wet-bulb temperature, which is the combination of temperature and humidity, effectively measures the level of heat stress conditions on humans. Wet-bulb temperature is measured by sliding a wet cloth over the bulb of a thermometer, the evaporating water from the cloth should cool the thermometer down. But when humidity is high, less evaporation will occur, so the wet-bulb temperature will be closer to the dry temperature. Humans usually regulate their temperature by sweating, but above the wet-bulb temperature, they can no longer cool down this way, which marks a limit to human adaptability to extreme heat. A wet-bulb temperature of 35°C can be fatal.

High temperatures are also linked to irritability, fatigue, and decreased performance, which can increase the risk of injury when undertaking activities such as operating vehicles and power tools.

There is evidence to suggest that higher daily temperatures are associated with an increased propensity for assault. The risk of drowning deaths has also been shown to increase during heatwaves.

These risks are not shared equally across the population – socio-economic factors play a tremendous role in heat risk to the creation of heat islands. Urban areas, where structures are highly concentrated and greenery is limited, become islands of higher temperatures relative to outlying areas. In cities, areas with lower socio-economic conditions have less vegetation, reduced access to air-conditioning and buildings with less insulation, causing them to feel hotter than wealthier areas. Research has found that more than 60% of deaths during heatwaves between 2001 and 2018 were in the most disadvantaged areas of Australia.[17] According to a heat survey[18] conducted by the Australia Council of Social Service (ACOSS) released in January, 62% said they struggled to keep their homes cool during summer, and 43% said they faced a barrier to leaving their home for a cooler place. Almost 90% said the high temperatures negatively affect their health.

16 Australian Institute of Health and Welfare, Let's talk about the weather: injuries related to extreme weather, 2 November 2023
17 Risk Frontiers, Heatwave fatalities in Australia: a new analysis, Newsletter Volume 20, Issue 3 – Article 1, accessed 27 November 2023
18 ACOSS, New report shows that action is needed to protect those on the lowest incomes from summer heat, 24 February 2023

Action

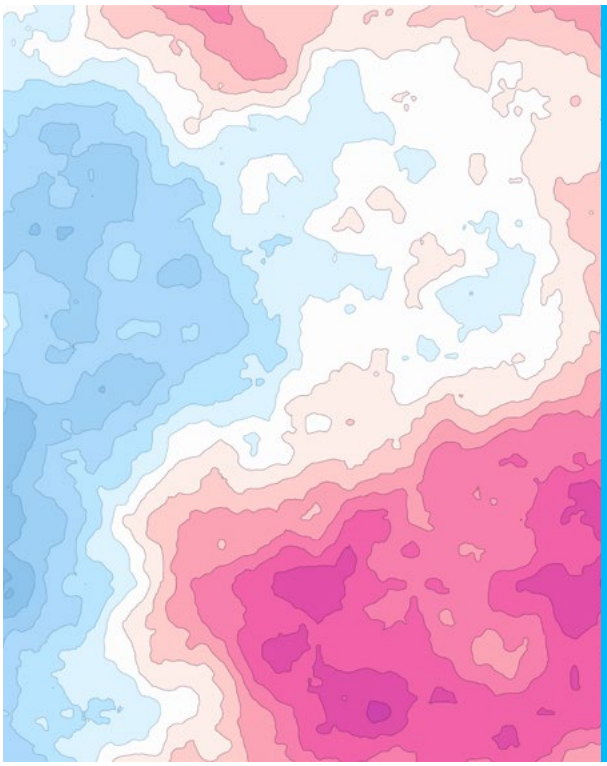
Cities around the world are preparing for hotter weather with the provision of cool public spaces. Cities including Toronto, Canada, Paris, Athens and Rotterdam are setting up cool spaces across their cities, which include libraries, museums and park spaces in which citizens can cool down on extremely hot days. However, there is still significant work to be done by councils to make sure that people are aware of cool spaces and see them as attractive places for them to go to.

Some groups are working with vulnerable populations to help install climate safe rooms in their dwellings. Community group Geelong Sustainability is currently running a pilot to retrofit homes to protect them from extreme weather, adding cooling systems in the houses of people identified as being vulnerable.

Impact

A meta-analysis on the risks and protective factors associated with heat-related mortality identified that visiting an air-conditioned space significantly reduced individuals' risk of mortality as compared to those who did not visit air-conditioned spaces.[19]

The Geelong Sustainability pilot found participants had 75% fewer days where they experienced discomfort from heat. They also reported improved mental and physical wellbeing, increased activity in their home and fewer trips to the doctor.



"Though Australia has long grappled with heatwaves, the evolving landscape of climate change introduces the potential for unprecedented conditions. The consequences extend beyond mere economic and infrastructural concerns, permeating into the realms of public health and wellbeing to an extent that we may not fully comprehend yet."

DR VERONIKA EMETC

Associate Director, Audit & Assurance

19 S. Widerynski, P. Schramm, K. Conlon, et al. The Use of Cooling Centers to Prevent Heat-Related Illness: Summary of Evidence and Strategies for Implementation, CDC, National Center for Environmental Health, [PDF], accessed 27 November 2023
A. Bouchama, et al. Prognostic factors in heat wave related deaths: a meta-analysis, NIH, National Library of Medicine, 12 November 2007

Worker safety and productivity

05

Context

The impacts of extreme heat on worker safety and productivity presents a multifaceted challenge that transcends geographical and sectoral boundaries. With the International Labour Organization (ILO) predicting a loss of more than 2% of total working hours worldwide by 2030,[20] there is a strong call for immediate and sustained action to mitigate these impacts.

Heat stress carries not only the potential to kill, but also to significantly reduce people's capacity to work. In Australia, this has translated to an estimated $7 billion cost to the economy during 2013–2014, encapsulating lost workdays, impaired efficiency and poor health among both office and outdoor workers.[21] Looking ahead, the NSW Treasury models project losses of up to 2.7 million working days per year due to heatwaves by 2061,[22] and by 2070, the broader Australian economy could face losses of $3.4 trillion and 880,000 jobs.

The agriculture and construction sectors are notably vulnerable, with these industries expected to account for a substantial proportion of working hours lost to heat stress by 2030. This vulnerability is compounded by the ageing workforce, as older workers exhibit lower physiological resistance to heat.

Action

Governments and employers will have to ensure that legislation and HR rules prioritise worker safety. Spain has already legislated to prohibit outdoor work when the national weather agency AEMET issues an alert warning about a severe or extreme risk of high temperatures.

In Australia there is not a specific temperature at which action must be taken by an employer, but an employer's duty of care means that people carrying out work in extreme heat must be able to do so without risks to health and safety. Many unions have agreements in place over managing this; for instance, the Electrical Trades Union agreement rules that when temperatures are forecast to be above 35°C, employees must be relocated out of direct sunlight or into an air-conditioned area. Governments will have to find ways of working with industry to ensure that workers are not financially disadvantaged by an increasing number of extreme heat days.

As the number of extreme heat days continues to grow, there will need to be a concerted focus from government on how to support employers and employees during heat events, from legislating to ban working outdoors during the day in an extreme heat event, to adapting work hours to cooler times of the day.

Adaptation will also be an important strategy for employers wanting to keep employees safe while maintaining productivity, potentially through augmenting some tasks in construction and agriculture with robotics.

Impact

Managing workforce safety and productivity during extreme heat events will have significant implications for the health of Australian workers. By considering what role adaptation will have in employee safety, employers have the opportunity to offset some of the declines in productivity and maintain some operational continuity during extreme heat events.

20 International Labour Organization, Working on a warmer planet: The impact of heat stress on labour productivity and decent work, [PDF], accessed 27 November 2023
21 Doctors for the Environment Australia, Heatwaves and health in Australia, [PDF], accessed 27 November 2023
22 The Australia Institute, HeatWatch: Extreme Heat in Western Sydney, [PDF], accessed 27 November 2023

Resilient Assets & Infrastructure

06

Context

Development of heat resilient infrastructure will be essential to maintain the continued function of societies during extreme heat events, while also ensuring that value is not lost through inefficiencies and service failure. Extreme heat poses significant challenges for things that most people take for granted in developed economies: services such as electricity, working footpaths and roads, and transport infrastructure.

Utilities like power grids risk blackouts and brownouts during extreme heat events. Because the National Electricity Market (NEM) is an interconnected grid across Australia, high demand in one state can usually be met by extra supply from another. But during the hotter months heatwaves often occur simultaneously across multiple regions increasing pressure on the grid. As our summers get hotter, this pressure is likely to continue to intensify.

In Australia, heating and cooling account for 40% of household energy use: the majority of demand. As global temperatures rise, the energy required to cool businesses is expected to rise as well. Energy needs for space cooling are projected to triple by 2050. The Intergovernmental Panel on Climate Change (IPCC) estimates that four billion cooling appliances are already installed in properties; a figure that could rise to 14 billion by 2050.[23]

Studies found that for every degree rise in threshold temperature (18°C) in Australia, the average cooling energy demand will increase by 0.45% to 4.6%, while the annual average energy consumption will increase by 0.5% to 8.5%. The cooling energy demand of urban buildings will be at least 13% higher than in similar rural buildings. Given that Australia's average summer temperature is higher than 27°C and 90% of the country is urbanised, rising temperatures may seriously affect the energy supply.[24]

High temperatures won't just lead to high demand – they can also impair key electrical infrastructure. Generators, transformers, transmission lines, and even solar panels and wind turbines become less efficient in hot temperatures, and so provide less energy to the system. The hotter transmission lines get, the less electrical current they can safely carry.

An initial scoping study was undertaken by TransGrid to assess the potential implications of climate on transmission lines, with results forecasting that some lines could see their maximum power capacity reduced by up to 7%.[25]

A hotter climate will also have implications across the entirety of the transport sector. For example, planes experience 1% less lift with every 3°C of temperature rise. During a heatwave in 2018, planes at London City Airport were forced to leave passengers on the ground to take off safely.[26]

Trains will need to adapt for these new weather conditions as well. As seen in the summer of 2022 in Europe, when the air temperature reaches 40°C, the track temperature can reach 60°C. The steel rails often expand as they get hotter and start to buckle. There is also a risk that the catenary wires, which supply electricity to electric trains and need to be straight to work properly, will relax, posing safety hazards to operating trains.

23 Intergovernmental Panel on Climate Change, AR6 Climate Change 2022: Mitigation of Climate Change, [PDF], accessed 27 November 2023
24 K. Yenneti, et al. Urban Overheating and Cooling Potential in Australia: An Evidence-Based Review, Climate, 2020, 8(11), 126
25 ESCI project, The impact of climate change on transmission line ratings, [PDF], accessed 27 November 2023
26 A. Romano, British Airways Boots 20 Passengers From Flight Due to Blistering Heat Wave, yahoo!finance, 31 July 2018

Action

While there will be new climate risks that will affect all airports, having data that supports the specific challenges faced by each respective location will be necessary for organisations working to adapt. The specific heat challenges faced by London City Airport were compounded by a shorter runway, and the same logic can be applied across each piece of infrastructure, all of which will require an individual, location-based approach to managing extreme heat risk.

Ensuring that the power grid is fit for extreme heat will be a significant challenge to avoid the consequences of rolling blackouts. Strategies to alleviate this will include new equipment design to make sure it can handle temperature changes and increasing energy efficiency programs to alleviate continued stress on the grid. Governments are already looking at how they can reduce short-haul flights as a means of managing GHG emissions, but there will likely be a further push to high-speed rail as extreme heat conditions make it unsafe for planes to operate.

Research from the IEA suggests that globally, 15% of regional flights could be replaced with high-speed rail journeys by 2050 using current infrastructure.[27]

In Europe, rail companies are already experimenting with ways of adapting to these new heat extremes, using data to monitor track temperatures both with sensors in the tracks and local air temperature. These are being trialled alongside strategies to improve the albedo (how reflective a surface is) of the tracks, such as painting them white.

Impact

Maintaining infrastructure stability will be essential to avoid the cascading impacts of extreme heat days; for instance, electricity blackouts leading to vulnerable populations experiencing heat-related illnesses.

Taking a proactive stance will also allow organisations time to make the necessary case for investment into strategies that will require significant resources to become heat safe.

"We need to ensure that our existing and future infrastructure is fit for purpose in the face of increased risk of extreme heat. To effectively address these heightened risks, it is crucial to incorporate adaptation measures into 'business as usual' retrofitting and infrastructure replacement. Failing to do so will render infrastructure less efficient and more prone to long-term disruptions. Our advice to governments and infrastructure operators is to factor long-term heat risk into decision-making from the very beginning and consider risks at a systemic level."

TERRY RAWNSLEY
Director, Planning & Infrastructure Economics

27 International Energy Agency, Net Zero by 2050: A Roadmap for the Global Energy Sector, [PDF], accessed 27 November 2023

Energy-Efficient Places

07

Context

Residential electricity use can be three to four times higher than normal on days that are 35°C or hotter, placing stress on the power grid and increasing the risk of blackouts or power shortages.

Similarly, plant and equipment capacity, particularly in HVAC systems, are designed to operate within a defined temperature band; on days of extreme heat, those existing systems are unable to cope. Most commercially available air-conditioning systems are designed to be operated in conditions beneath 38°C.

Outside of residential and commercial spaces occupied by people, cooling mechanisms in data centres need to work harder to ensure that servers don't overheat, requiring additional water to keep evaporative cooling mechanisms working.

Action

New planning rules will be required to ensure that new buildings consider heat in their designs and how old buildings are retrofitted to make them safe.

Western Sydney Regional Organisation of Councils research has found that NSW building regulations regarding thermal comfort targets do not meet the current forecasts around climate projections for the coming years.[28] Governments will have to ensure that building regulations are designed to meet current climate scenarios for the future.

Designing buildings that can remain functional at higher temperatures will require the development of passive buildings, which maximise the use of natural elements such as sunlight, shade and ventilation to regulate a building's temperature and eliminate the need for traditional cooling systems.

Reducing the heat load more broadly will be an important strategy for buildings; for instance, by painting roofs with light coloured or highly-reflective paint. There is an opportunity for public/private partnerships to help accelerate this shift. In New York City, the municipality is offering low-cost installations to building owners to help reduce the burden of this transition.

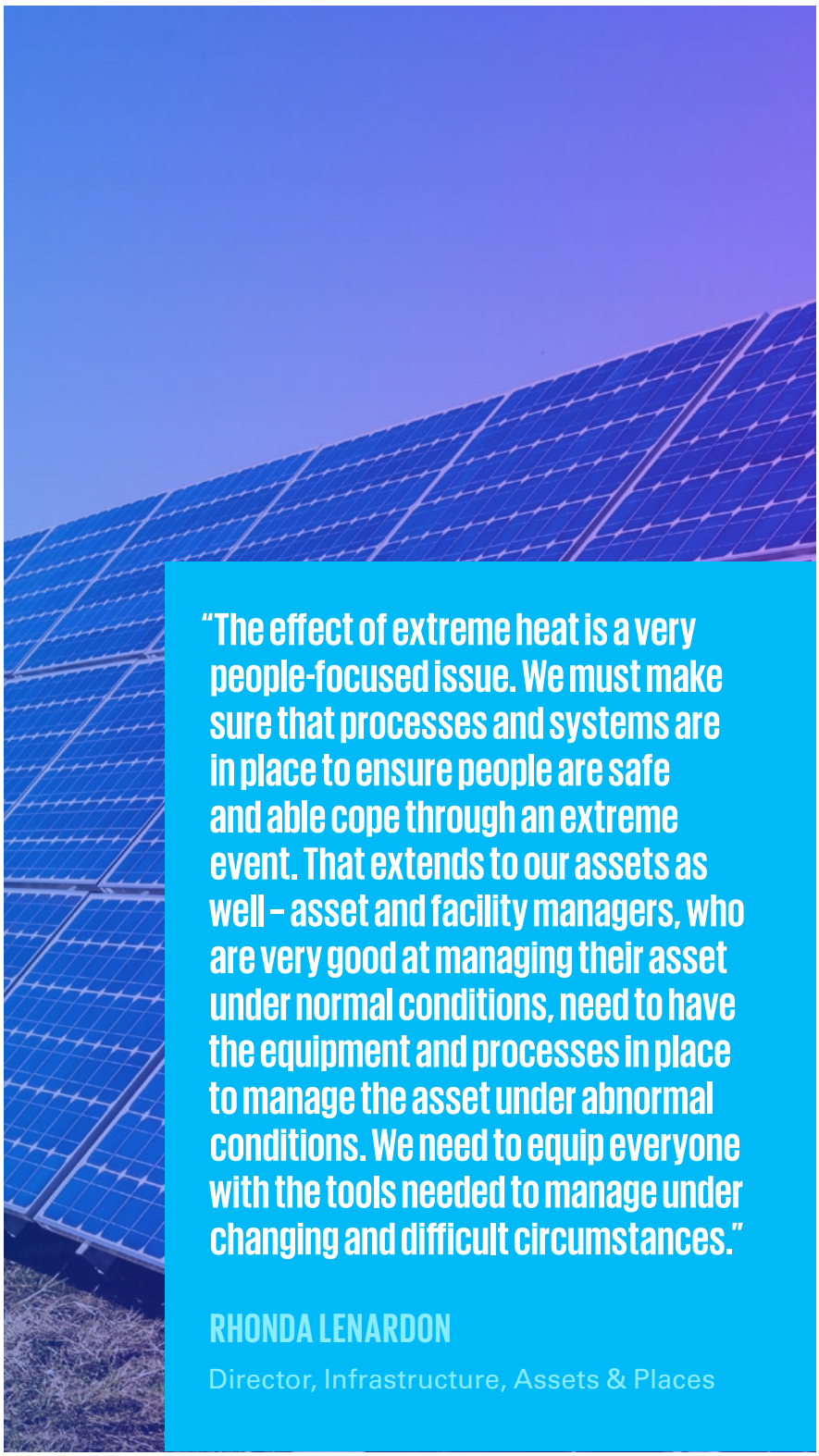
Green walls and roofs are another opportunity to help create cooler buildings and provide additional benefits around reducing heat island effects.

28 Western Sydney Regional Organisation of Councils, Future proofing residential development in Western Sydney 2022, [PDF], accessed 27 November 2023

Impact

Ensuring that new buildings meet the needs of future climate will minimise the number of buildings that require retrofitting. In preparing new buildings for future climate events, cities are already reaping benefits today.

Painting roofs with light coloured or highly reflective paint can reduce building energy use by up to 20%, research in California and Florida has found.[29] The energy benefits reported from green roofs and walls varies based on location, but the gardens and green walls on One Central Park in Sydney reduce the thermal impact on the apartments by approximately 20%, as well as bringing additional wellbeing benefits from being closer to nature.



"The effect of extreme heat is a very people-focused issue. We must make sure that processes and systems are in place to ensure people are safe and able cope through an extreme event. That extends to our assets as well – asset and facility managers, who are very good at managing their asset under normal conditions, need to have the equipment and processes in place to manage the asset under abnormal conditions. We need to equip everyone with the tools needed to manage under changing and difficult circumstances."

RHONDA LENARDON

Director, Infrastructure, Assets & Places

29 The University of Melbourne, Cool Roofs: City of Melbourne Research Report, [PDF], accessed 27 November 2023

Smart urban planning

08

Context

Every city has a unique population, character and landscape. How these factors interact determine a city's climate risk and the most effective actions for building resilience. Local governments will need to collaborate with the private sector to develop urban planning policies to strengthen resilience against extreme heat.

In densely developed areas, surfaces and structures obstructed by neighbouring buildings become large thermal masses that cannot release their heat readily. Cities with many narrow streets and tall buildings become urban canyons, which can block natural wind flow that would bring cooling effects.

According to the IPCC, the single biggest contributor to amplifying heat is urban geometry, the relationship between city layouts, building construction, and density.

Dark paving materials can reach peak summer temperatures of up to 65°C and consequently raise the temperature of the surrounding air.[30]

Action

Many cities around the world are focusing on how they can improve the albedo across a city to reduce the amount of heat retained. Using lighter coloured paving options to create more reflective surfaces can reduce heat risk, as can permeable pavements, which cool a city through the evaporation of moisture. In Victoria, building regulations mandate that new construction must incorporate permeable surfaces and private open spaces to counter the urban heat effect.[31]

One of the highest impact interventions is the provision of increased green coverage through planting more trees and green cover at street level but also on roofs. In Melbourne, the council has set a goal to plant 3,000 trees each year to increase the resilience of the urban forest and to cool the city by 4°C.[32]

Creating the circumstances where the increased tree cover succeeds is also essential. In Melbourne, the city is increasing forest diversity with no more than 5% of one tree species, no more than 10% of one genus and no more than 20% of any one family. It has also worked to create stormwater harvesting systems around its parks to protect the tree growth during times of extreme heat, which often coexist with periods of drought or dryness.

Understanding where and how air moves through a region also creates new opportunities for urban planners to identify how to maximise the contribution of natural geographic features to create ventilation corridors to cool areas.

The German city of Stuttgart has implemented this on a city-wide scale.[33] Located in a valley with low wind speeds, the city is susceptible to the heat island effect and poor air quality. It implemented a natural green belt strategy to create pathways for winds to sweep down from the hills to ventilate the city. This included zoning and regulating development along green belts and divides. The strategy also increases connectivity between rural areas and the city centre and supports the wellbeing of citizens by ensuring more open space in an otherwise built-up urban environment.

Impact

Smart urban planning will have a tremendous impact on the quality of life for people living in urban areas. Increased green cover, and making sure there is enough space between tall buildings for air to flow, also adds a liveability aspect to heat management strategies.

30 Global Cool Cities Alliance, A Practical Guide to Cool Roofs and Cool Pavements, [PDF], accessed 27 November 2023
31 Houzz, Understanding Victorian planning regulations, Domain, 10 January 2023
32 City of Melbourne, Cooling our city, accessed 27 November 2023
33 Climate ADAPT, Stuttgart: combating the heat island effect and poor air quality with ventilation corridors and green-blue infrastructure, accessed 27 November 2023

The benefits of action

09

Extreme heat risk is a nationwide problem that affects all parts of society from human health and infrastructure operations through to continuity and safety across all sectors. The interconnected nature of these challenges requires a systemic approach that is driven from the top levels of leadership and works in a cross-sector, collaborative way, across corporate, government and the not-for-profit sectors to create tailored, localised actions.

Collaboration between many stakeholders will be required to address complex issues and having more time will allow local and state governments to work with stakeholders in a focused way across economic, natural and social systems, before it's too late to put in place long-term interventions. For instance, some of the best practice interventions, such as planting trees, will take time to create impact, so the sooner action is taken, the quicker locations will reap the benefits.

"Without the data to make informed decisions and manage risk, local governments, emergency management, infrastructure providers and those shaping our cities, risk flying blind when planning, building and designing the programs and strategies to plan for tomorrow and mitigate the impacts of heat. By working with KPMG, we not only enable data driven decision-making, but we can advise local governments and critical organisations and services to enhance their resilience in the face of climate change."

JOSEPH GLESTA
ClimaSens founder and CEO

How to adapt

	SHORT TERM	LONG TERM
	Assess population safety: Create plans to support vulnerable populations this summer.	Prepare and action a heat adaptation strategy: Take a systems level view of how extreme heat will put systems under pressure and explore best-practice solutions specific to each location.
	Communicate heat risk to wider stakeholders, build public/private collaborations that will empower a cohesive response.	Invest in tailored climate adaptation efforts.
	Consider workforce safety and business continuity: How will you manage the risk of heat on your workforce? Will it be possible to maintain business continuity on a day of extreme heat? What tasks will need to be postponed or rescheduled?	Assess potential risk to assets and what kinds of interventions will be required to make them heat safe. Work with governments and NGOs to support efforts being done at a local level to manage heat stress.
	Assess what impacts extreme heat will have on assets and broader costs of doing business around insurance and finance.	Invest in heat management strategies, and work with finance and insurance providers to ensure these changes are reflected in finance costs.

Plan

Understanding the heat threats and their impact on your organisation is pivotal to addressing the challenges presented by extreme heat in the years ahead. Managing heat risk will require scenario planning and mapping of assets on a systemic, granular and localised basis. Access to quality data will be critical during the planning stage. Without data to pinpoint what and where the risks are, governments are limited in their ability to make informed decisions that deliver impactful outcomes.

Prepare

Effectively preparing for heat risks involves comprehensive assessments of the human, commercial, financial, and operational impacts. Use the data to create a strategy that minimises the effects of extreme heat events on your people, operations, assets and infrastructure.

Adapt

Invest and execute mitigation strategies that will support both short-term and long-term risks. Today's solutions should be designed with future climate risks in mind. Organisations will need to work to create always-on adaptation strategies that manage emergent and long-term risks, both on a BAU basis and at all stages of projects.

Respond

Despite efforts to manage extreme heat events, they are likely to become more intense and more frequent in the coming years. All levels of government alongside private organisations will need to build robust and holistic strategies to maximise physical welfare and minimise risk through periods of extreme heat.

How KPMG can help

10

Navigating extreme heat risk is only going to get more important. Delayed action is likely to increased economic and societal costs. We will help you cut through the complexity, identify present and emerging risks, and, most importantly, take action.

Combining our deep sector knowledge across heat resilience, local government, infrastructure and industry with the ClimaSens data platform, we can help clients with granular insights and foresight in the space, alongside the ability to plan, implement and adapt accordingly.

We can map out your assets and overlay the ClimaSens data platform to understand the heat and population risk. We can then model and plan to minimise the heat risk, both during an extreme heat event and for longer term heat mitigation.

With KPMG you can bring greater confidence to heat risk management. We'll work with you to assist you to navigate the immediate risks, while also working to mitigate and manage the long-term ones.

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