BRIEFING PAPER:

Heat and the planning system: A case for change in NSW

A briefing paper to the NSW Department of Housing, Planning and Infrastructure

Western Sydney Regional Organisation of Councils Limited.

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1. Executive summary

Heat kills more Australians than fire, floods, and storms combined[1], and is responsible for the highest number of hospitalisations from extreme weather. In addition to health impacts, research shows our city's critical infrastructure is vulnerable to heat impacts. This includes energy networks, transport systems, mains water and telecommunications systems. NSW Treasury has outlined the need to better understand economic impacts of heat on areas including workplace productivity, infrastructure costs, as well as costs relating to service delivery such as increased hospital admissions which directly increases healthcare expenditure.[2]

Our growing cities contribute to the problem, as adding more concrete, steel and bitumen to the urban environment increases the urban heat island effect. However, Sydney's growth also provides significant opportunities to embed climate resilience in urban change. Delay in addressing this issue will not only miss opportunities for widescale heat resilient design, but lock-in significant future costs for government, industry and communities, including increased energy use (leading to pressures to the energy grid), costs to the health system, as well as costly future retrofits.

The role of the planning system

Considered planning and urban design controls are a critical lever to creating cooler, healthier and more liveable urban environments in the face of a changing climate. However, there are presently no mandated requirements for addressing heat in the NSW planning framework except in a small number of council LEPs and DCPs. The lack of system-wide guidance and controls limits on ground application because:

- A significant proportion of new development is approved through state planning pathways.
- A lack of state directive leaves councils open to legislative challenges creating delays.
- A patchwork of locally-led heat controls across Sydney creates uncertainty for industry.
- Without mandated requirements most developers will not prioritise heat.
- Councils with less resourcing, capacity or political will are less able to implement changes.

Given the complex nature of the NSW planning system, it is important that heat is addressed across the hierarchy of planning instruments (state and local) to ensure heat is addressed at the building scale, as well as the urban design and precinct scale. Legislative change will be critical, as current

[1] Australian Institute for Health and Welfare (2023). *Let's talk about the weather: injuries related to extreme weather*. https://www.aihw.gov.au/reports/injury/extreme-weather-injuries/contents/extreme-heat

[2] NSW Treasury (2021). *TTRP21-05 An indicative assessment of four key areas of climate risk for the 2021 intergenerational report.* www.treasury.nsw.gov.au/documents/ttrp21-05-indicative-assessment-four-key-areas-climate-risk-2021-nsw-intergenerational

reliance on guidance and a fractured approach to regulation, is resulting in hot, energy-hungry homes and suburbs that do not support community health and wellbeing.

Recommended changes

This document was developed as part of the Greater Sydney Heat Taskforce program. The Taskforce is a collaboration of state agencies, local government, industry and the community sector. The Greater Sydney Heat Taskforce has been established to develop governance arrangements and provide strategic guidance on agreed initiatives to reduce risk and build heat resilience.

The Taskforce identified changes to the NSW planning system to address heat as a key priority to achieve the vision of *A Greater Sydney where people can thrive in a warming climate and survive extreme heat events*.

Specifically, Taskforce stakeholders 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 application of controls, using up to date applicable climate data / climate zones (NSWRA)
- Provide guidance and support to improve clarity, consistency and justification for changes. Including strengthening compliance and guidance through planning circulars (incl. case studies, background information, urban heat and vulnerability mapping).

This document outlines recommended changes to the NSW planning system and was prepared in consultation with councils in Greater Sydney.

Figure 1 (next page) provides an overview of changes required across the system.

Implementation

We acknowledge the importance of ensuring government, industry and communities have lead-in time to prepare for changes. Therefore, we propose a staged approach, with the following to be delivered within next three years (by December 2027). In order of priority:

1. Include urban heat controls in the Sustainable Buildings SEPP.
2. Prepare formal urban heat guidance.
3. Ensure urban heat considerations are secured in a Ministerial Direction.
4. Work with the Federal and State Governments to ensure that NatHERS and BASIX use future climate files.

5. Initiate amendments to integrate urban heat clauses into key SEPPs including:
    - Precincts SEPPs
    - Exempt and Complying and Development SEPP
    - Standard Instrument LEP
    - Apartment Design Guide (under the Housing SEPP)

We stress that any changes should build on the great work already undertaken at the local level, see *Attachments A* and *B* for examples of current and model clauses addressing heat.

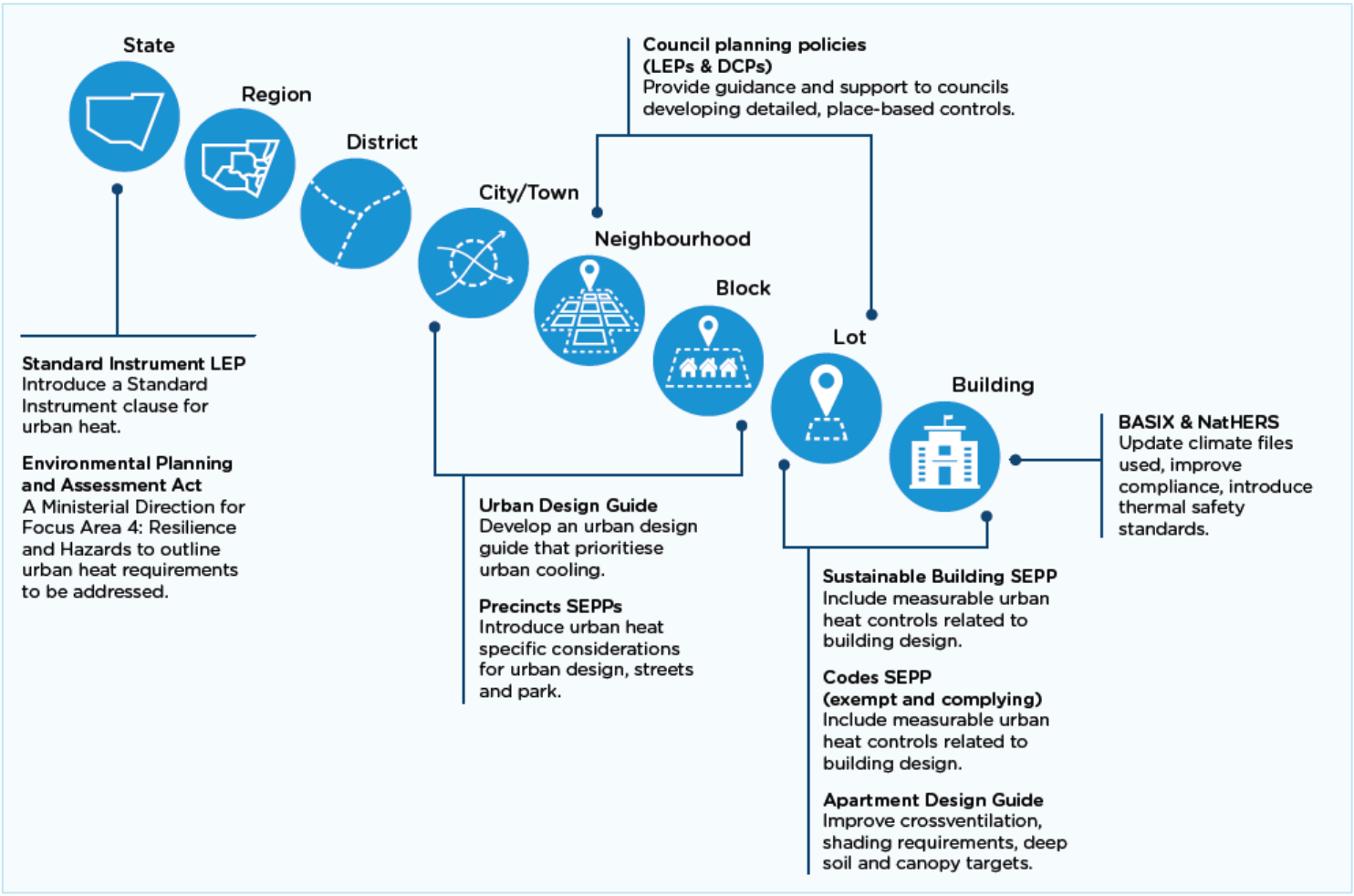


Figure 1. Proposed changes to the NSW Planning System (image modified from Draft Urban Design Guide)

2. Introduction

2.1 Heat is a significant and growing challenge

Heat kills more Australians than fire, floods, and storms combined[3], and is responsible for the highest number of hospitalisations from extreme weather (Figure 2). Between 2001 – 2018 more than half of Australia's heat-related deaths occurred within or near (mostly residential) buildings[4], emphasising the importance of the built environment in protection from heat events.

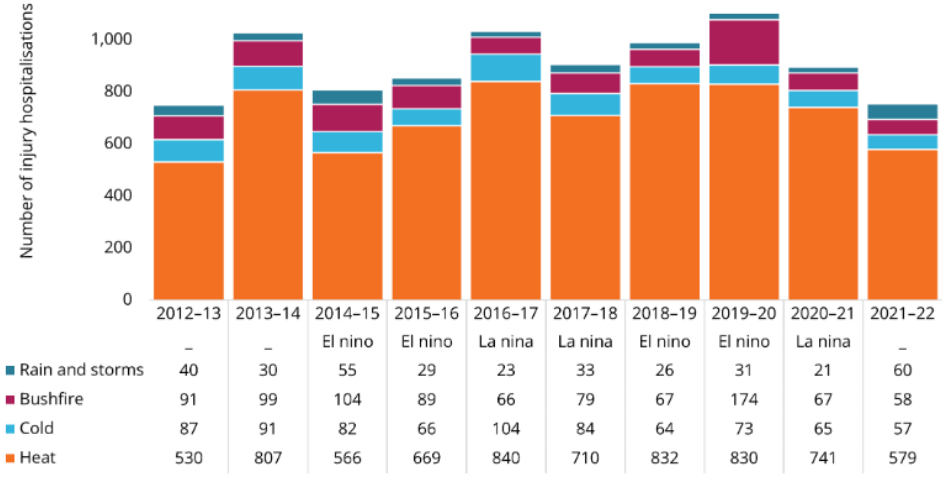


Figure 2. Australian hospitalisations due to extreme weather, 2012-13 to 2021-22 1.

In addition to health impacts, research shows our city's critical infrastructure is vulnerable to heat impacts. This includes energy networks, transport systems, mains water and telecommunications systems, just to name a few. [5]

Heat also has significant economic impacts. A recent report from the Committee for Sydney estimates the total costs from heatwaves in Western Sydney are $1.4 billion per year today, and growing. 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.[6] These impacts are expected to increase as our climate warms and the growth of our cities adds to the urban heat island effect.

[3] Australian Institute for Health and Welfare (2023). *Let's talk about the weather: injuries related to extreme weather*. https://www.aihw.gov.au/reports/injury/extreme-weather-injuries/contents/extreme-heat

[4] Coates et al. (2022). Heatwave fatalities in Australia, 2001 – 2018: An analysis of coronial records. *International Journal of Disaster Risk Reduction, 67,* https://doi.org/10.1016/j.ijdrr.2021.102671

[5] Resilient Sydney (2018). *A Strategy for City Resilience,* https://www.cityofsydney.nsw.gov.au/governance-decision-making/resilient-sydney

[6] Committee for Sydney (2024) *Burning Money: The rising costs of heatwaves to Western Sydney*. https://sydney.org.au/wp-content/uploads/2024/03/Burning-Money_FA_WEB_R2.pdf

2.2 What do we mean by heat?

Heat is a complex hazard with multiple, interlinked drivers. A holistic approach to heat hazard address three key drivers:

- **Climate:** The natural conditions in an area, and the change expected in future due to greenhouse gas emissions.
- **Urban heat:** Local microclimates that develop due to qualities of the built environment.
- **Heatwaves:** Large scale weather events that cannot be prevented but should be considered in planning and urban design (e.g. thermal safety).

Each of the above drivers are interrelated, with complex feedback loops contributing to the conditions experienced in a particular place at a particular time. Importantly, as outlined in Figure 3, each of the above drivers requires different design solutions to address. For example, canopy cover can reduce urban heat islands, and assist carbon sequestration but will do little to protect people during heatwave events, when safe indoor spaces are needed.

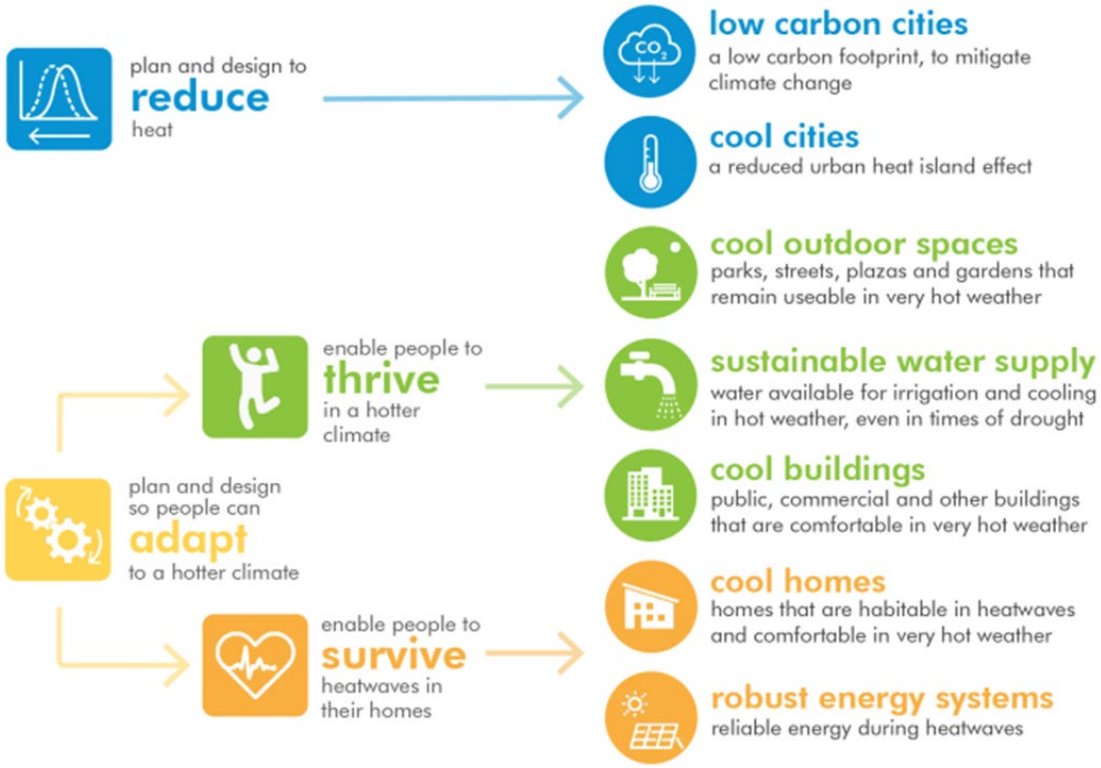


Figure 3. Urban planning and design approaches to mitigate and adapt to heat.

2.3 Planning is a key lever for addressing heat risk

Considered planning and urban design controls are a critical lever towards creating cooler, healthier and more liveable urban environments in the face of a changing climate. Relatively simple urban design measures have been shown to reduce average peak ambient temperatures by as much as 2 degrees[7]; improving quality of life, cost-of-living, and contributing to reduced emissions. Further, there are critical adaptive design measures that should be taken to improve the way communities, businesses, and infrastructure function in a warming climate and during extreme events.

The unprecedented rate of growth Sydney is currently experiencing provides significant opportunity to embed climate resilience into the urban fabric of our growing city. However, delay in addressing this issue will not only miss opportunity for widescale heat resilient design, but lock-in significant future costs for government, industry and communities, including increased energy use (leading to pressures to the energy grid), costs to the health system, as well as costly future retrofits.

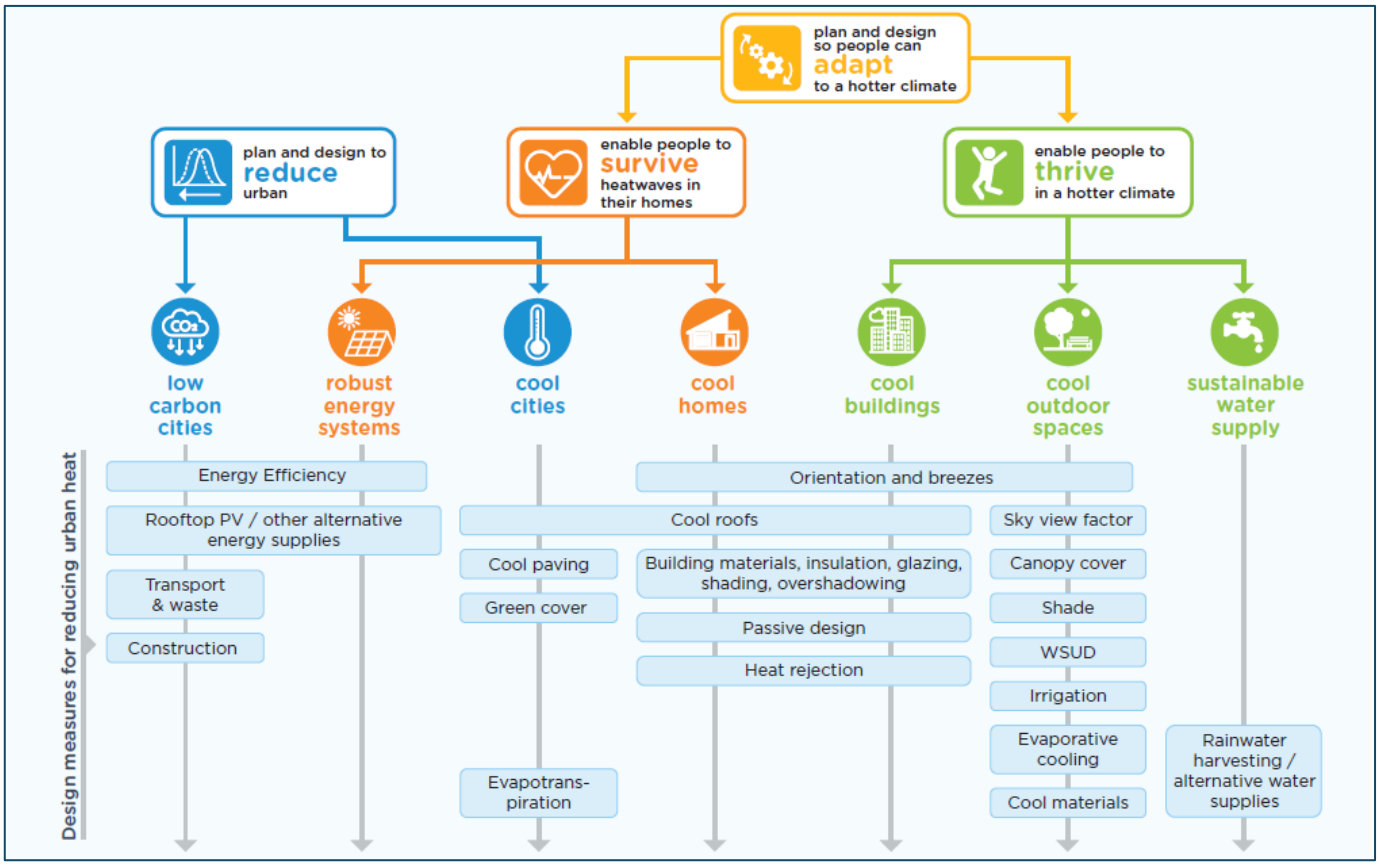


Figure 4. Design measures for reducing urban heat. Building resilience is cumulative, so a combination of measures that reduce urban heat and support adaptation are needed to help people to survive heatwaves and thrive in a warmer climate.

[7] Sydney Water Corporation (2017*). Cooling Western Sydney*. https://www.sydneywater.com.au/content/dam/sydneywater/documents/cooling-western-sydney.pdf

2.4 What we've heard

Despite heat being a significant and growing hazard in urban areas, there are presently no requirements for addressing heat in the NSW planning framework except in a small number of council LEPs and DCPs. The lack of system-wide guidance limits on ground application because:

- A significant proportion of new development is approved through state planning pathways, most of these pathways do not currently address heat.
- A lack of state directive leaves councils open to legislative challenges creating delays.
- A patchwork of locally-led heat controls across Sydney creates uncertainty for industry.
- Without mandated requirements most developers will not prioritise heat.
- Councils with less resourcing, capacity or political will are less able to implement changes.

The need for updating the current planning framework has been identified as a critical need by local government stakeholders and the community. Further, engagement with industry has found a strong desire for clear, consistent information on how to achieve heat resilient design.

Strategic, land use planning, and development control are shared responsibilities, with different consent authorities required for different types of development as well as a broad group of other actors. As such, a collaborative approach is required to ensure state and local controls as well as guidance work together to deliver outcomes.

3. Heat and the NSW planning system

3.1 Heat is a new and emerging issue for planning

Heat is a significant and emerging issue for cities around the world, and Australian cities are no exception. Because of this, governance arrangements to manage heat hazard are still developing.

There is presently no requirement for addressing urban heat in the NSW planning framework except in a small number of council DCPs. Many of our current planning controls and regulations were written before the impacts of heat were understood. However, research is now clear that frequency of large-scale heatwaves and record-high temperatures are considered critical risks to our communities and environments, and enough information is now available through research and pilots projects, to guide better urban planning and design[8].

3.2 NSW State Disaster Mitigation Plan

In 2024 the NSW Reconstruction Authority released Australia's first State Disaster Mitigation Plan (SDMP). The Plan provides a strategic vision to address statewide challenges and realise opportunities related to disaster risk reduction and manage natural hazard risks, including heat and heatwave. The Plan identifies strategic planning controls as a critical tool to mitigate future disasters, including heatwave, and recommends to 'develop a suite of planning controls for natural hazards'.

WSROC and councils see this briefing paper as a starting point for this process, and we welcome further collaboration with the NSW Reconstruction Authority and NSW Department of Planning, Housing and Infrastructure in improving planning controls for urban heat and heatwave.

3.3 Local government policy and programs

The vast majority of work to understand and implement heat into the planning system has occurred at the local level. As outlined above, urban heat has been addressed in a small number of council LEP and DCP controls. However, councils' capacity to do so has largely depended on each councils' resourcing, expertise and political will. While there is limited formal reference to heat in the planning system, it should be noted that significant work has been undertaken to understand how heat can and should be effectively addressed in the planning system. Three key projects have been delivered to date:

[8] Australian Government. Department of Climate Change, Energy, the Environment and Water (2024). *National Climate Risk Assessment*. https://www.dcceew.gov.au/sites/default/files/documents/national-climate-risk-assessment-first-pass-assessment-report-2024.pdf

- **Urban Heat Planning Toolkit**[9]: Developed in response to Greater Cities Commission directive for councils to address urban and extreme heat in their planning instruments. The Urban Heat Planning Toolkit provides an overview of the NSW planning system and the types of issues that councils can (and cannot) address via LEPs and DCPs. The Toolkit includes sample clauses and recommendations for changes to state-level policies. The Toolkit has been used by many councils to inform the LEP and DCP clauses.
- **Cool Suburbs NSW**[10]**:** Cool Suburbs is a science-led rating and assessment tool for heat resilient development. Cool Suburbs was developed in response to calls for clear, evidence-based guidance on how to address heat and has been developed in partnership with leading researchers, government agencies and development industry representatives. Cool Suburbs has been used to inform planning by the Bradfield Development Authority, several council DCP clause and is currently an approved pathway for Green Building Council of Australia's Green Star Communities tool. Note: The updated NSW Cool Suburbs Tool will be available online from September 2024.
- **Futureproofing Residential Development**: WSROC and Waverly Council have led Futureproofing Residential Development studies in order to understand the efficacy of NatHERs and NSW BASIX in future climates and heat events.

Figure 5 shows where Cool Suburbs and the Planning Toolkit sit in the planning and development process.

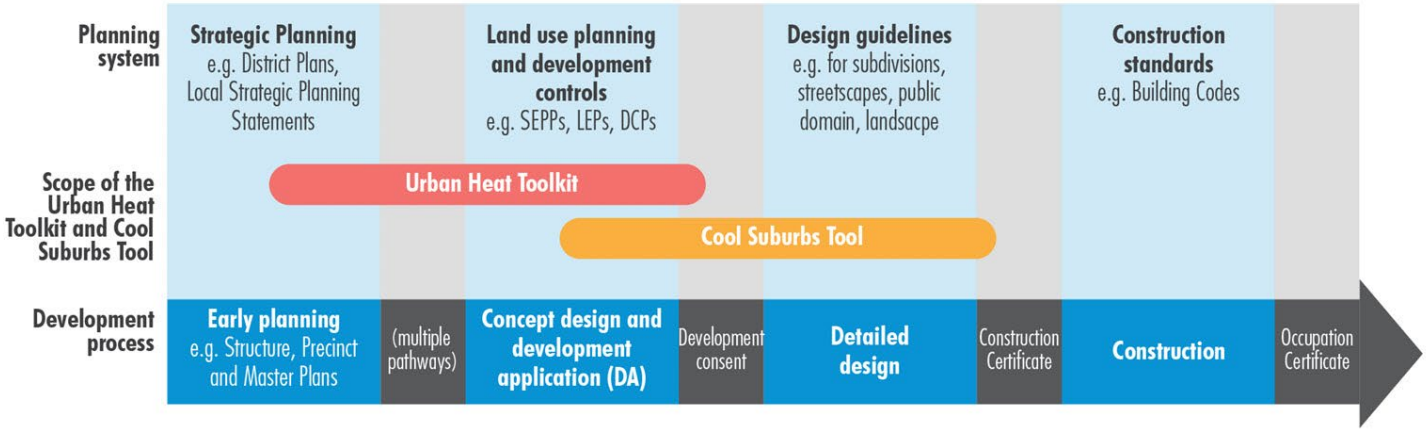


Figure 5. Scope of the Urban Heat Planning Toolkit and Cool Suburbs in terms of stages in the planning and development process

[9] WSROC (2021). *Urban Heat Planning Toolkit*. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=306&catid=3&m=0

[10] WSROC (2022). *Cool Suburbs*. https://coolsuburbs.com.au/

4. The need for change across the NSW Planning System

Given the complex nature of the NSW planning system, it is important that heat is addressed across the hierarchy of planning instruments, because:

- **Heat needs to be addressed at different scales.** The Sustainable Buildings SEPP addresses the building scale, while Precincts SEPPs address urban form. All are important to ensure a consistent approach to addressing heat across different development types and scales.
- **The appropriate level of detail differs at different levels of planning regulation.** For example, ensuring heat and climate change are addressed in the EP&A Act is important, but unless appropriate detail is included in lower-level instruments (SEPPs, LEPs and DCPs), the outcome on the ground will be lacking. A lack of specific requirements for addressing heat prevents developers from understanding cost implications when purchasing land, and makes it unclear what consent authorities should consider during approval processes. For example: having a higher-level objective to address heat could in theory be satisfied by planting a single tree, without consideration for other measures we know are important, e.g. urban form, deep soil, material choices, shade, and water management, unless these are defined in more detail.
- **The addition of urban heat management controls across the planning system will ensure consistent application across the state.** This will not only increase urban heat reduction but increase certainty for both development assessors and industry, streamlining design and approval processes, and reducing associated costs.

A summary of the proposed changes is outlined in Table 1 in the next section. Sections 5 - 8 include further details on each of the proposed changes. Attachment A outlines examples of current LEP and DCP clauses addressing heat, and Attachment B includes case studies of current planning outcomes.

4.1 Summary of proposed changes

Table 1 outlines the proposed changes across the NSW planning system to ensure heat is addressed across development scales and types. Further detail on each of these recommendations is included in the sections following.

Table 1 – Outline of proposed changes

Instrument	Issue	Recommendation
Environmental Planning and Assessment Act *(Ref. Section 5)*	Addressing heat is consistent with the current objectives as outlined in the *Environmental Planning and Assessment Act 1979.* Refer Objects (a), (b) and (g). The existing Act provides the opportunity to ensure urban heat is included as an environmental consideration, utilising the existing objectives under the Act to develop stronger controls in planning instruments.	A Ministerial Direction is prepared for *Focus Area 4: Resilience and Hazards* to outline urban heat requirements to be addressed. This will ensure the matters are included in any planning proposals, similar to flooding.
Sustainable Building SEPP *(Ref. Section 6)*	The current SEPP addresses internal thermal performance of individual buildings (i.e. not urban heat). The SEPP's clause 2.2 nullifies other controls (i.e. council controls) that affect the thermal performance of residential development. Most urban heat controls affect the thermal performance of development so are "switched off" by the SEPP.	Include measurable controls in the SEPP related to building design, including: • cool roofs and green roofs • trees and deep soil • external shading and reduced glazing • natural cross ventilation • increased insulation • cool and permeable pavements • location of heat exchangers (external part of air conditioning systems) • ceiling fans in all habitable rooms (main living rooms, dining rooms and bedrooms).

		Address water requirements as current requirements disincentivise tree planting and vegetation as they affect the water rating of the development if potable water is used.
BASIX & NatHERS *(Ref. Section 6.2)*	BASIX / NatHERS use outdated climate data (pre-2010 climate). This has two main impacts: • Home designs are optimised to perform in a far cooler climate than we experience today. • Homes designed to perform in 2050 are not allowed to be built under today's BASIX standards. BASIX / NatHERS assess thermal performance, which is based on energy use. It does not take into account actual internal building temperatures and the impacts on human health during a heat wave in an unconditioned home. E.g. not is not a thermal safety standard. BASIX / NatHERS assess thermal comfort with the assumption that mechanical cooling and power are accessible. The software used to model NatHERS ratings are a form of "black box". NatHERS certificates do not include sufficient information to allow model inputs to be interrogated thoroughly by others	Improve BASIX standards to ensure that all new development is designed to respond to climate projections for the different NSW climate to 2050 to ensure that dwellings remain thermally safe for occupant in a warming climate. This will reduce community vulnerability to a warming climate as well as avoiding a future scenario where we are heavily reliant on mechanical cooling. Introduce thermal safety standards. Update climate files used in BASIX and NatHERS to reflect worst case days (not typical days) in summers and winters to 2070-2100. Review the BASIX/NatHERS governance framework to identify measures to ensure independent compliance during design, construction and occupation certificate stages. Work with the CSIRO and NatHERS software providers to develop a NatHERS certificate that can use the CSIRO's future climate files.

	(including consent authorities). It seems clear that measures that reduce urban heat like external shading are often 'modelled out'. Lack of information and poor governance of the scheme has undermined trust in NatHERS certificates and their ability to predict actual performance of development. Whilst the CSIRO has developed future climate files for the 2035 – 2050 time period, and the files can be used in the NatHERS engine, there is currently no mechanism to generate a NatHERS certificate using the future climate files. This means that a Development Applicant could not generate a NatHERS certificate to submit with the BASIX Certificate in NSW.	
Codes SEPP (Exempt and Complying Development) *(Ref. Section 6.3)*	A significant and growing proportion of development utilises the exempt and complying development pathways in SEPP (Exempt and complying development codes) and so bypasses councils' DCPs . This includes the majority of development in new growth areas, and approximately half of development in Western Sydney. Greenfield development (conversion of natural to urban areas) represents the greatest contribution to urban heat islands but also the greatest opportunity for good design if appropriate controls are in place.	Modify existing complying development controls to require: • cool roofs and green roofs • trees and deep soil (# and area) • need to amend the minimum landscaped area to accommodate deep soil zones/canopy trees. • external shading and reduced glazing • natural cross ventilation • cool and permeable pavements • location of heat exchangers (external part of air conditioning systems)

		This action could be addressed by including requirements in the Sustainable Building SEPP and ensuring that they are applicable to complying development.
Apartment Design Guide (ADG) *(Ref. Section 6.4)*	Current cross-ventilation requirements (at least 60% of first nine storeys) in the ADG are insufficient to support thermal comfort and thermal safety for all residents, and often lead to inequitable outcomes. Glazing and shading requirements are important to ensure solar access is balanced with thermal comfort and thermal safety. Current deep soil requirements are considered inadequate	Increase cross-ventilation requirements at all levels of buildings and provide clearer definitions to reduce inequity in thermal comfort and thermal safety outcomes for residents within the same building. Ensure glazing and shading requirements balance provision of solar access while ensuring thermal comfort and thermal safety for all residents, noting that this was proposed in the draft Design and Place SEPP. Urban Heat review by a Design Excellence Panel and during the assessment stage.
Precincts SEPPs *(Ref. Section 7)*	Currently no state planning instrument deals with heat at the urban design scale. These considerations do not relate to a single building so are not affected by the Sustainable Buildings SEPP clause.	Introduce urban heat specific considerations for urban design, streets and parks. These could be drafted like Standard Instrument Clause 5.21 Flood Planning and should cover: • layout of streets • location and size of parks and water bodies • wind paths and ventilation of public spaces • retention of existing trees • shade in streets and parks • cool and porous pavements • inclusion of water sensitive urban design features and irrigation

		(refer to the Cool Suburbs tool for specific design requirements for urban design, streets and parks)
Urban Design Guide *(Ref. Section 7.3)*	Develop an Urban Design Guide to act as a comprehensive resource to guide the design of the built environment in NSW, focusing on urban heat as a dimension. NSW currently lacks a reference for urban design that mitigates heat when assessing development. An Urban Design Guide could inform Local Planning Instruments, Development Control Plans (DCPs), development of Indicative Layout Plans and Design Review Panels.	Develop an urban design guide that prioritises urban morphology that supports cool urban environments, and sets minimum benchmarks for deep soil and tree canopy cover both for public spaces and private land to mitigate the urban heat island effect, maximise urban amenity, and contribute to green infrastructure networks. Include larger street verge widths, WSUD and retaining water in the landscape, and reflective surfaces, facades, roofs. (The Cool Suburbs tool and the former Design and Place SEPP could inform such a guide)
Standard instrument LEP *(Ref. Section 8)*	Introducing a Standard Instrument LEP clause on heat and climate change will expedite up councils' including heat into LEP and DCPs. The Greater City Commission District Plans stated that councils should address urban heat and heatwaves through their LEP and DCPs. However, without state guidance on the types of controls that are acceptable, and support from higher order planning instruments, councils face challenges implementing this strategic directive (politically, from gateway, and from industry).	Introduce a Standard Instrument clause for urban heat. (refer to WSROC's Urban Heat Planning Toolkit for an example standard clause which could be considered. any standard clause should be developed in close consultation with local government)

4.2 Implementation: A staged approach

We stress the urgency to ensure heat mitigation and adaptation measures are formally embedded across the NSW planning system. The rapid rate of urban development across Sydney, and greenfield development in particular, is quickly exacerbating urban heat across our city. Delay in addressing this issue will not only miss significant opportunity for widescale heat resilient design, but lock-in significant future costs for government, industry and communities, including increased energy use (leading to pressures to the energy grid), costs to the health system, as well as costly future retrofits.

Legislative change will be critical, as current reliance on guidance and a fractured approach to regulation, is resulting in hot, energy-hungry homes and suburbs that do not support community health and wellbeing[11].

However, we equally acknowledge the importance of ensuring government, industry and communities have lead-in time to prepare for changes. Therefore, we propose a staged approach, with the following to be delivered within next three years (by December 2027). In order of priority:

6. Address the barrier created by the Sustainable Buildings SEPP clause 2.2 by including urban heat controls within the SEPP.
7. Prepare formal urban heat guidance based on the Cool Suburbs Tool, Urban Heat Planning Toolkit and current planning controls implemented by councils.
8. Ensure urban heat considerations are secured in a Ministerial Direction. Focus Area 4: Resilience and Hazards section would be a possible section Urban Heat needs to be addressed.
9. Work with the Federal and State Governments to ensure that the NatHERS tool and associated software are updated to ensure that they can generate a NatHERS Certificate using future climate files.
10. Initiate amendments to integrate urban heat clauses into key SEPPs including:
    - Precincts SEPPs
    - Exempt and Complying and Development SEPP
    - Standard Instrument LEP
    - Apartment Design Guide (under the Housing SEPP)

As stated previously, a lot of work has been delivered on addressing heat through urban planning and design. There is an opportunity to build on existing work, particularly the Urban Heat Planning Toolkit[12]

[11] UNSW, WSP, WSROC (2022). Future Proofing Residential Development in Western Sydney. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=360&catid=3&m=0

[12] WSROC (2021). *Urban Heat Planning Toolkit.* https://wsroc.com.au/media-a-resources/reports?task=download.send&id=306&catid=3&m=0

and the Cool Suburbs Tool[13] that were developed based on latest evidence and research to provide guidance on addressing heat. Both these projects were funded by the NSW Government and developed in close collaboration with councils, government agencies, research experts and industry.

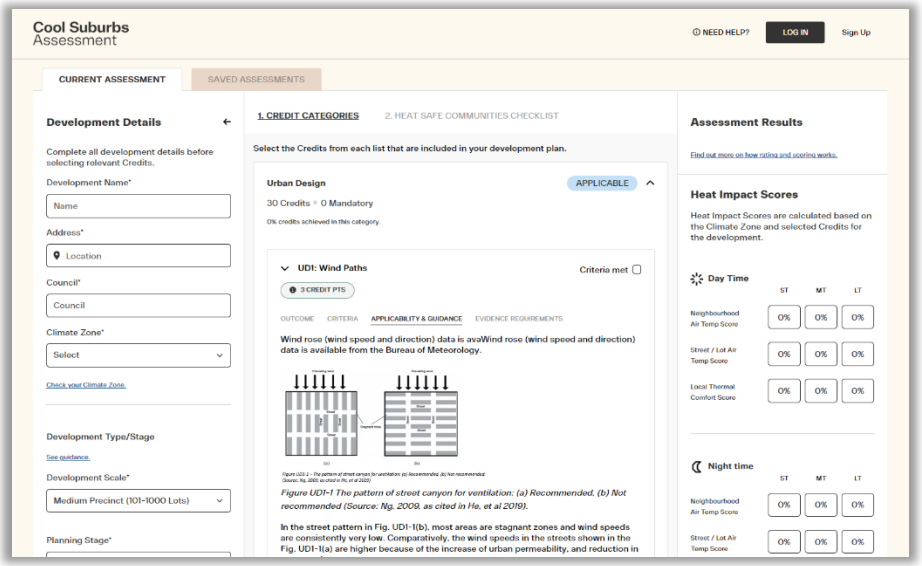


Figure 6. Example of Cool Suburbs assessment interface.

4.3 Support for councils

Addressing urban heat through planning is relatively new. Beyond changes to planning instruments as identified in this document, council planning teams have indicated the need for ongoing support from the NSW Government to provide clarity, consistency and justification for changes, including:

- Planning circulars on urban heat:
    - Provide assurances to planners that they are able to make changes that align with state planning policy.
    - Provide planners with background and prompts for changes to LEPs and DCPs.
    - Provide justifications to discuss proposed changes with decision-makers and Councillors.
- Develop heat hazard mapping to inform urban cooling requirements.
    - heat Vulnerability mapping for Sydney hasn't been updated since data was captured in 2016.
    - Utilise this and other hazard mapping to inform LEP maps and planning certificate considerations the same way flood, bushfire and coastal hazards currently are.

[13] WSROC (2022). *Cool Suburbs*. coolsuburbs.com.au. (Note: the Cool Suburbs Tool is currently being updated to be applicable across NSW. New Tool is set to be released before September 2024).

    - Hazard mapping could be the mechanism to enforce additional urban cooling controls.
- Strengthen the compliance support that is available to ensure Private Certifiers are meeting existing minimum requirements. This would significantly enhance the ability of the planning system to reduce urban heat as well as function more effectively.

5. Environmental Planning and Assessment Act

Addressing heat is consistent with the current objectives as outlined in the *Environmental Planning and Assessment Act 1979*. Refer Objects (a), (b) and (g). The existing Act provides the opportunity to ensure urban heat is included as an environmental consideration, utilising the existing objectives under the Act to develop stronger controls in planning instruments.

It is proposed that a Ministerial Direction is prepared for *Focus Area 4: Resilience and Hazards* to outline urban heat requirements to be addressed. This will ensure the matters are included in any planning proposals, similar to flooding.

6. Addressing heat at individual building level

6.1 Sustainable Building SEPP

Thermal comfort internal and external to a dwelling are closely interlinked but not equally represented in the NSW planning system. Mechanisms such as NSW BASIX have been emplaced to govern the internal thermal performance of a dwelling, however there are currently no similar measures to address external thermal performance (i.e. urban heat).

Local councils are unable to take strong action to fill this void because SEPP (*Sustainable Buildings*) includes Clause 2.2 that nullifies controls that affect the thermal performance of residential development.

> *2.2* ***Standards not affected by environmental planning instruments or development control plans***
>
> *(1) A competing provision of an environmental planning instrument or development control plan, whenever made, is of no effect to the extent to which the provision aims—*
>
> *(b) to improve the thermal performance of development…*

Most urban heat controls affect the thermal performance of development so are "switched off" by the SEPP. In practice, this prevents council LEP and DCPs from enforcing standards beyond those outlined in the SEPP, even where they may be included.

The addition of controls to manage and reduce urban heat to SEPP (*Sustainable Buildings*) will ensure consistent application across the state, including for complying development.

Measurable controls related to building design include:

- cool roofs and green roofs
- trees and deep soil
- external shading and glazing
- natural cross ventilation
- Increased insulation
- cool and permeable pavements
- location of heat exchangers (external part of air conditioning systems)
- ceiling fans in all habitable rooms (main living areas and bedrooms).

These specific measurable controls can and should be included in SEPP (*Sustainable Buildings*) to apply to both residential and non-residential development, in addition to the existing BASIX tool and performance-based metrics of NatHERS for homes. Including urban heat controls in the SEPP will avoid them being switched off by Clause 2.2.

In addition to the above, the current Sustainable Building SEPP requirements disincentivise tree planting and vegetation as they affect the water rating of the development if potable water is used. Greater onus on use of recycled water systems is needed to address this loophole and encourage tree planting and vegetation.

6.2 BASIX and NatHERS

Thermal performance for residential development is currently regulated by the National Construction Code and BASIX including the NatHERS framework. BASIX and NatHERS use climate data to predict the internal thermal environment of proposed designs, with the aim of reducing energy use for heating in winter and cooling in summer. However, recent work to assess the performance of BASIX and NatHERS has found limitations in addressing heat.

There are four key issues we believe BASIX and NatHERS need to address to manage heat impacts well into the future:

1. These tools do not currently address external thermal performance (urban heat).
2. These tools do not currently measure human safety in current and future climates.
3. These tools do not currently allow councils to prescribe place-based measures where empirical evidence and community concerns suggest these are needed.
4. NatHERS governance is poor and consequently real-world building performance is not meeting policy objectives.

First, while there is overlap between thermal performance and urban heat, focusing only on internal thermal comfort can result in worsening urban heat effects, i.e. negative externalities. A typical example is heat attracting dark roofs to improve winter thermal performance.

BASIX and NatHERS do not deal with the externality of cumulative urban heat island effects, or the priority of reducing urban heat in a warming climate with more and longer heat waves, so a different set of controls is required to deal with this at the **individual building** and **master planning level**.

Second, NatHERs and BASIX need to be reviewed to ensure they are providing adequate internal thermal comfort in current and future climates. Two *Future Proofing Residential Development* studies have recently been delivered which modelled how current building standards perform under future

climate scenarios[14][15]. These studies found NSW BASIX and NatHERS use outdated climate data which is delivering new homes that are both energy hungry (high emissions) and thermally unsafe. Importantly, the study showed that NSW BASIX makes it illegal today to build homes that would perform well in 2030 and 2050 climates.

Specifically, these studies found:

- Dwellings in Western Sydney are currently designed for a historical climate which does not represent today's conditions, nor those we will experience in future.
- BASIX-compliant homes became thermally unsafe when tested in 2030 and 2050 climate conditions, as well as under heatwave conditions (modelled on the 2017 heatwave).
- Homes modified to perform better in the future, failed to meet today's NSW BASIX standards and therefore are not allowed to be built. This is because current thermal comfort standards are based on pre-2010 climate, where heating is prioritised over cooling. Whereas the current and future climates will require a stronger focus on cooling.
- If we continue designing for historical climate, homes will neither be energy efficient nor heat resilient. This results in increased energy network demand, higher household energy bills, higher residential emissions and increased health impacts.

It will be critical for human health and wellbeing that BASIX and the Sustainable Building SEPP are reviewed and updated with more representative climate files and encourage construction of buildings that are designed for the future climate, minimising cooling energy consumption, and delivering better heat resilience.

In addition, thermal safety standards will be required to ensure at least part of a dwelling can maintain an acceptable indoor environment during extreme weather events without a mechanical heating and cooling system (ref Penrith DCP C14 for an example of a DCP clause that aims to achieve this).

Further, independent assessment will be critical to ensure BASIX/NatHERS compliance. A review of the current BASIX/NatHERS governance framework is recommended. This should be done by an independent agency to identify measures to ensure compliance during construction and ensure ongoing refinements to the tool and framework. For example, the NABERS governance framework is a model that should be examined for adoption for NatHERS assessments.

[14] UNSW, WSP, WSROC (2022). *Future Proofing Residential Development in Western Sydney*. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=360&catid=3&m=0

[15] WSP (2021*). Future Proofing residential Development to Climate Change*. https://www.waverley.nsw.gov.au/__data/assets/pdf_file/0006/181788/Future_Proofing_Residential_Development_to_Climate_Change_Final_Report_January_2021.pdf

Lasty, councils seek the ability to investigate and introduce measures beyond current BASIX standards where local circumstances warrant this consideration to improve liveability (such as in cases of urban heat stress) without an onerous or prohibitive approval process.

6.3 Exempt and Complying Development

A significant and growing proportion of development utilises the exempt and complying development pathways in SEPP (*Exempt and Complying Development Codes*), bypassing council DCP controls. In Western Sydney more than half of development bypass councils' approval pathways[16][17].

For example, since 2020, Liverpool City Council has received 4,786 via the Codes SEPP and 1,633 via the Development Application pathway. Table 3 on the next page provides an overview of approval pathways for Greater Western Sydney Councils as retrieved from the NSW Planning portal.

A trend exacerbating the issue is that the scope of Complying Development is increasingly expanded (e.g., dual occupancies, manor houses, terraces), bypassing urban heat provisions in LEPs and DCPs. This undermines councils' ability to manage local development impacts. Council DCP requirements on urban heat often only affect brownfield development and those utilising local approval pathways. Greenfield developments and those using exempt/complying pathways remain unaffected, creating an inequitable system and discouraging residents from using council services. Increasing standards that impact DAs alone will simply push more residents towards the CDC pathway, achieving little in terms of urban heat mitigation.

As urban heat (and extreme heat) is an emerging issue in the planning system, it was not considered during the development of the Exempt and Complying Codes SEPP. Proposed controls outlined in section 4.1 of this paper should also be integrated into the Codes SEPP if their inclusion in the Sustainable Buildings SEPP does not apply to complying development.

In addition, research should be undertaken into increasing landscaping requirements and consequently potentially decreasing the maximum Gross Floor Area permitted under the Codes SEPP for all housing types. The current provisions for housing within the Codes SEPP are inadequate in mitigating urban heat as they encourage developments with high site coverage and limit opportunities for tree planting.

Currently under Part 3, Division 3 of the Codes SEPP, a dwelling requires:

- Front setback: Sites 300m2 to 900m2 - 4.5m or average of two adjoining dwellings

[16] WSROC (2021). Urban Heat planning Toolkit. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=306&catid=3&m=0

[17] NSW Planning Portal. *Local Development Performance Monitoring (LDMP).* Local Development Performance Monitoring (LDPM) | Planning Portal - Department of Planning and Environment (nsw.gov.au)

- Rear setback: Sites 300m2 to 900m2 - 3m for single storey dwellings
- Maximum Gross Floor Area (GFA): Sites 250m2 to 300m2 - 75% of site area
- Landscaping: Sites 300m2 to 450m2 - 15% of site area, minimum 1.5m width

The Codes SEPP should have greater emphasis and be specific regarding tree planting requirements, require the use of cool materials such as roof material/colours and bricks and include requirement for deep soil and limiting hard surface areas for all developments, to enable he accommodation of private and public street trees.

Table 2 – Percentage of developments approved by Complying Development SEPP per LGA, Greater Western Sydney councils (development bypassing councils)[18].

2020/21	
LGA	**% of CDCs as a total DA and CDC determined**
Blue Mountains City Council	8%
Camden Council	60%
Campbelltown City Council	63%
City of Canterbury-Bankstown	53%
City of Parramatta	58%
Cumberland Council	58%
Fairfield City Council	62%
Liverpool City Council	32%
Penrith City Council	52%
The Hills Shire Council	55%
Wollondilly Shire Council	38%

**Note Blacktown and Hawkesbury data was not available for this year on the NSW database.*
**Note there are other pathways for large value developments that also bypass local controls (e.g. large apartment buildings of a certain value).*

6.4 Apartment Design Guide (ADG) and Housing SEPP

Apartment Design Guide and SEPP (Housing) 2021 – Chapter 4 provides for a 'one size fits all' approach to high density residential developments in New South Wales. This approach is not suitable for developments which are not located near the coastline and as such coastal breezes are absent. The ADG design criteria states, 'At least 60% of apartments are naturally cross ventilated in the first nine

[18] NSW Planning Portal. *Local Development Performance Monitoring (LDMP).* Local Development Performance Monitoring (LDPM) | Planning Portal - Department of Planning and Environment (nsw.gov.au)

storeys of the building. Apartments at levels ten or above are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed'.

This usually means that the architect will achieve minimum compliance using the bigger apartments (2 to 3 bedrooms), leaving the smaller apartments (studios and 1 bedroom) with no natural ventilation. This creates a high negative impact for developments in Western Sydney which experience higher temperature days, weather extremes and absent from coastal winds.

Further amendments should be explored regarding implementing clauses within the ADG, State Environmental Planning Policy (Housing) 2021 and Environmental Planning and Assessment Regulation 2021 to ensure larger scale developments have higher proportions of cross-ventilated apartments and are subject to Urban Heat review by a Design Excellence Panel and during the assessment stage.

In addition, the current ADG controls for deep soil are considered inadequate to achieve optimal growing conditions for large trees. Overreliance by industry on the ADG standards is a barrier to local government introducing stronger deep soil requirements.

The Urban Tree Canopy Targets and Development Controls Report is considered a good reference and has informed suggested controls in NSW DPHI's Greener Neighbourhoods guide. These should be the minimum requirement with the ability for local government to stipulate greater controls for deep soil and canopy coverage.

7. Addressing heat at urban / master plan level

Heat needs to be addressed at multiple development scales. Urban heat controls for new suburbs and urban renewal areas are critical and offer the biggest opportunity to achieve urban cooling (ref Cool Suburbs). When heat is not addressed at scale, risk is pushed down onto communities and residents, leading to detrimental impacts on health and liveability outcomes, as well as exacerbating cost of living pressures.

In this way, historic planning and design decisions determine the long-term risk exposure of communities, which will be further exacerbated by the effects of climate change (Figure 7).

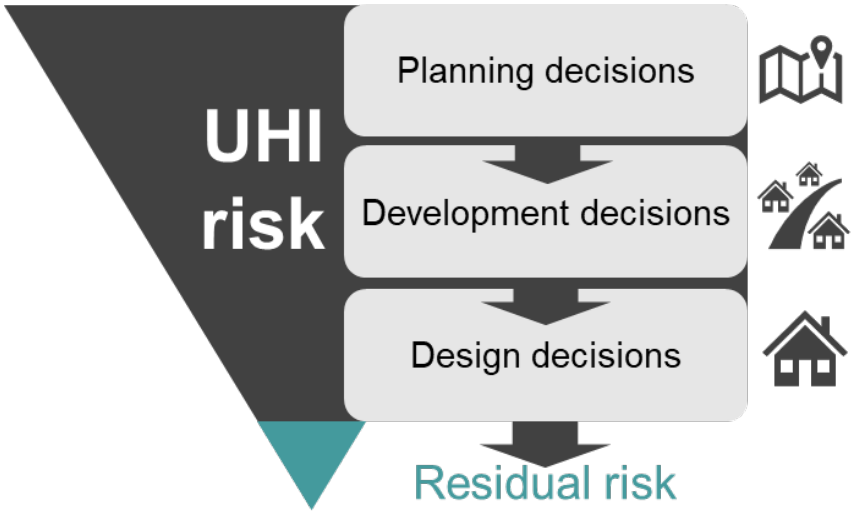


Figure 7. Heat risk should be addressed across the planning and development process to minimise residual risk to communities

7.1 Precincts SEPP

It is critical that design considerations to manage urban heat are part of master planning of new areas, including greenfield and urban renewal areas and should include the below considerations:

- layout of streets
- location and size of parks and water bodies
- wind paths and ventilation of public spaces
- retention of existing trees
- shade in streets and parks
- cool and porous pavements
- inclusion of water sensitive urban design and irrigation

Refer to the Cool Suburbs tool for guidance on these considerations for urban design, streets and parks (Note: Cool Suburbs is currently being updated to apply to all NSW climate zones).

These considerations should be dealt with through development of a clause for the Standard Instrument that can also be used in the SEPP (*Precincts*). These considerations do not relate to a single building so are not affected by the Sustainable Buildings SEPP clause. Similarly, these considerations should also be secured in a Ministerial direction and supported by a guidance documents.

7.2 DCP clauses

It is critical that the Sustainable Buildings SEPP issue is resolved so specific guidance on how to address urban heat in new developments can be included in DCPs. Where large areas of land are undergoing significant development (such as greenfield or brownfield development), addressing urban heat in the earliest stages of the planning process (design phase) will deliver the best outcomes.

Refer to Cool Suburbs for more specific guidance on addressing heat at the urban scale, and Attachment B of this document for an example model DCP clause.

7.3 Urban Design Guide

NSW currently lacks a reference for urban design that mitigates heat when assessing development. An Urban Design Guide could inform Local Planning Instruments, Development Control Plans (DCPs), development of Indicative Layout Plans and Design Review Panels.

Such a guide should build on the Urban Design Guide as developed under the former Design and Place SEPP, but also Cool Suburbs NSW and other existing work, and should include guidance on:

- prioritisation of urban morphology that supports cool urban environments
- sets minimum benchmarks for tree canopy cover both for public spaces and private land to mitigate the urban heat island effect, maximise urban amenity, and contribute to green infrastructure networks.
- set canopy targets for open spaces,
- set tree canopy targets for different land-use categories within large developments.
- set specific canopy and deep soil targets for detached dwellings based on lot size.

8. Standard Instrument LEP

It is recommended that the Department of Planning, Housing and Infrastructure (DPHI) apply an urban heat clause within the Standard Instrument LEP, to ensure a standardised Urban Heat clause, applicable to relevant climate zones (refer to Cool Suburbs), is included in all Local Environmental Plans and State Environmental Planning Instruments, and measures are undertaken to reduce the impact of urban heat upon NSW, particularly those LGA's within Western Sydney.

Introducing a Standard Instrument LEP clause on heat and climate change will speed up councils' ability to including heat into LEP and DCPs. The Greater City Commission District Plans (2018) stated that councils should address urban heat and heatwaves through their LEP and DCPs. However, without guidance on the types of controls that are acceptable, and support from higher order planning instruments, councils have faced, and continue to face, challenges implementing this strategic directive (politically, from Gateway, and from industry). The result is that only a small number of councils have been able to introduce strong urban heat controls, where they have the resources, political will and community support to do so.

The Urban Heat Planning Toolkit[19] (p48) provides an example standard clause that may be considered for the Standard Instrument LEP. Cool Suburbs also includes design considerations for urban design, streets and parks which could be included in a Standard Instrument LEP clause (see section 3.1) or Cool Suburbs could be referenced as the way to demonstrate compliance with the standard instrument clause. It is proposed the NSW Government works closely with councils to prepare a Standard Instrument LEP clause to address heat.

The Standard LEP clause should be accompanied by guidance and example / model DCP clauses. Refer to the Urban Heat Planning Toolkit for an example model DCP clause, and Attachment A for existing DCP clauses.

[19] WSROC (2021). *Urban Heat Planning Toolkit*. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=306&catid=3&m=0

9. Other considerations: tree retention

Despite efforts to mandate one small tree per dwelling, this alone will not be sufficient to maintain tree canopy levels, especially in areas with significant existing tree cover. The rollout of the reforms as proposed in the *Explanation of Intended Effect: Changes to Create Low and Mid-Rise Housing*, will lead to more applications seeking to remove trees, with the proposed EIE suggesting the replacements of only one or two trees. This would inevitably result in a significant net loss of trees, increasing urban heat island effects, reducing urban habitat, associated diversity of flora and fauna, and reducing the highly valued green character of our suburbs.

There needs to be stronger controls to mitigate the loss of tree canopy, particularly in the face of increasing urban intensification. As currently proposed, the reforms make it impossible to meet the NSW Government's target of increasing urban canopy to 40% across Sydney by 2035.

Stronger restrictions on proposals to prevent removal of existing, healthy, mature trees are recommended. A stronger control should be implemented requiring additional planting rates depending on how far below 40% of the original site is covered by tree canopy. This should be supported by larger minimum deep soil zones, lower maximum FSRs, and more stringent tree planting requirements.

It is noted that such provisions should be supported by appropriate penalties for illegal tree removal. Current fines are insufficient deterrents as they are well below potential improvements in land value delivered by the removal of trees.

Attachment A – examples of existing controls

I. Blacktown City Council

The Blacktown Health & Education Precinct exhibition went on Public Exhibition in October 2023.

It contains several proposed controls to mitigate urban heat.

Vision and principles

Open space and public domain: increase the tree canopy cover and reduce urban heat island impacts

Movement, Access and Parking (Section 4)

Control:

- minimise the contribution of streets to urban heat through appropriate tree canopy cover and water sensitive urban design features.

Open Space and Public Domain (Section 5)

Controls:

- flexible and multipurpose spaces that are capable of supporting a range of community activities and events
- deep soil zones capable of supporting mature planting which contributes to shading and cooling
- green infrastructure that supports stormwater management, climate adaptation, and urban heat mitigation
- light coloured pavements and road surface to avoid heat absorption and retention.

Sustainability Objectives and Controls (Section 7)

To minimise energy use buildings are to be designed to:

- include high levels of insulation to reduce energy consumption and include energy efficient appliances
- incorporate green roof and green façade / green wall elements where demonstrably feasible to reduce heat loads on internal spaces,
- incorporate shading elements and landscaping on higher levels of buildings to reduce heat loads and encourage passive cooling.

Built form Objectives and Controls (Section 8)

Objective: Utilise treatments that minimise the impact of urban heat island including the use of green roofs, reflective roofs and cool pavements.

Control: Developments are to be constructed to reduce the need for active heating and cooling by incorporating passive design measures including design, location and thermal properties of glazing, natural ventilation, appropriate use of thermal mass and external shading, including vegetation.

II. Cumberland City Council

Cumberland City Council was one of the first councils to introduce specific urban heat controls in their LEP. Cumberland Local Environmental Plan 2021 - NSW Legislation

Urban heat

(1) The objective of this clause is to ensure new development incorporates effective design and ongoing operation to—

(a) reduce and remove urban heating from the environment, and

(b) protect community health and wellbeing.

(2) In deciding whether to grant development consent for the purposes of commercial premises, industries or residential accommodation, the consent authority must consider whether—

(a) the facade and roof of the proposed building and paved surfaces are designed to reduce adverse effects of solar heat on the surrounding land, including private open space and the public domain, and

(b) the awnings and eaves of the building are designed to provide shelter from the sun and improve public comfort at street level, and

(c) the heating, ventilation and air conditioning systems of the building are designed to minimise the release of heat in the direction of private open space and the public domain, and

(d) the development maximises the use of green infrastructure that is strategically designed and managed to support a good quality of life in an urban environment, and

(e) the development accommodates sufficient tree canopy, open space and deep soil zones to achieve urban cooling benefits, and

(f) the building is designed to achieve high passive thermal performance.

(3) In this clause—

deep soil zone—

(a) means the soft landscaped part of a site area used for growing trees, plants and grasses that—

(i) is unimpeded by buildings or structures above and below ground, and

(ii) provides opportunities for groundwater infiltration and canopy trees, and

(b) does not include basement car parks, services, swimming pools, tennis courts and impervious surfaces including car parks, driveways and roof areas.

green infrastructure means the network of green spaces, natural systems and semi-natural systems that support sustainable communities and includes waterways, bushland, tree canopy and green ground cover, parks and open spaces.

solar heat means radiant heat contained in the full spectrum of sunlight.

III. City of Parramatta Council

The City of Parramatta's 2023 DCP controls include strong guidance that address urban cooling (see section 5.4.3 in Parramatta Development Control Plan, 2023) , including controls for:

- Roof Surface
- Open Space
- Facades
- Heating Cooling Systems - Heat Rejection
- Green Roofs or Walls

Objectives

O.01 Reduce the contribution of development to urban heat in the City; and

O.02 Improve user comfort in the local urban environment (communal/private open space and the public domain).

Controls

C.01 Urban cooling objectives and controls contained within this Section apply to all new residential flat buildings and shop top housing 3 or more storeys; and non-residential development as defined below:

- New hotels and serviced apartments.
- New development containing office premises with a net lettable area (NLA) of 1,000m² or more.
- Significant alterations and additions to existing office premises with an estimate cost of works of $5 million or more, which increases total floor space by no less than 20%.
- New shopping centre/retail development with a GLAR of 15,000m² or more.
- New industrial development with a GFA of 20,000m² or more.

Refer to Parramatta Development Control Plan, 2023 for specific controls.

IV. City of Sydney

At the end of 2023 the City of Sydney reported draft DCP controls for exhibition relating to urban heat. The controls can be accessed here.

These controls covered 3 areas.

Deep soil and canopy (p16)

Leafy canopies offer multiple benefits: they provide shade, reduce surface temperatures and release moisture through transpiration. While setting canopy cover percentages is commonplace currently, it is a difficult metric to enforce at the development stage and they are frequently underprovided in practice. Instead, planning controls should stipulate a minimum number of trees of different sizes, supported by assumptions about canopy cover in the background. This is more easily checked and enforced in planning and development stages, enabling a more reliable outcome.

Deep soil controls often go hand in hand with tree planting and canopy controls. While its true trees planted in deep soil have better opportunity to grow large and live a long time, strictly connecting the two controls can reduce opportunities to achieve urban canopy. Planning controls should allow tree planting in a wide range of contexts, and encourage other forms of planting on structure in addition to trees in deep soil. This means that tree planting or canopy cover targets can be higher than what can be achieved in deep soil alone.

Solar reflectivity (p207)

Unlike dark roofs that absorb heat, lighter-coloured and more reflective roofs bounce sunlight away from buildings and urban areas. By mandating the use of materials and treatments with a high solar reflectivity index, we reduce rooftop temperatures, minimise energy consumption for cooling, and contribute to a more comfortable urban environment.

Planning controls can be structured in a way that this does not compete with rooftop uses such as gardens, shared facilities and solar panels.

External shading of glazing (p207)

While external shading primarily addresses internal heat, reducing the use of air conditioning plays an important role in reducing anthropogenic urban heat (heat caused by human activity). By requiring the use of shading devices such as awnings, louvers, or vegetation, we can avoid outcomes where glazing is subject to direct sunlight. This prevents excessive solar gain, reduces air conditioning loads and maintains comfortable indoor temperatures. Effective external shading not only enhances energy efficiency but also promotes occupant well-being. If the clause is constructed carefully it can also encourage a better (lower) proportion of glazing and a higher proportion of external wall that is better insulated.

V. Liverpool City Council

Liverpool's LSPS (Connected Liverpool 2040) notes that the Western District is known for having significantly lower tree canopy cover, which along with geography and continued increases in impermeable surfaces associated with urban development, contributes to an urban heat island effect that makes temperatures significantly higher than in eastern Sydney areas.

Liverpool's LSPS includes Local Planning Priorities such as those under Liveability which states that Council is committed to Council addressing environmental issues that place the community at risk, such as the urban heat island effect.

The LSPS includes for Council to work to mitigate and adapt to climate change, in partnership with the State and Federal governments. As Council has limited ability to influence sustainability outcomes for the vast majority of development, Council continues to strongly advocate for improvements to building codes and other associated State Environmental Planning Instruments in order to address issues of urban heat and climate change. We will also pursue opportunities to address energy, waste and water efficiency, such as the creation of solar farms, better design of precinct wide systems, increased tree canopy, and water sensitive urban design.

Table 3: Liverpool LSPS 'Connected Liverpool 2040'

LSPS Action	
3.1	Collaborate with neighbouring councils to improve open space and transport connections, including active transport routes, around Chipping Norton Lakes.
6.2	Investigate DCP changes to encourage green open space in high-rise development.
9.1	Amend DCP to better respond to urban heat.
14.3	Develop a strategy to increase tree canopy cover in the LGA.
14.6	Create green entryways to LGA along major road entry points.
15.1	Review LEP and DCP to suitably address sustainability in line with recommendations from emissions reduction and resource efficiency study.
15.4	Review LEP and DCP to address the Urban Heat Island Effect.
15.5	Review DCP to encourage new commercial and industrial buildings to be rooftop solar ready.
15.6	Review DCP to prioritise low carbon initiatives in future developments such as adaptive building designs, precinct-level car parking strategies and energy efficient, water- efficient, waste efficient and energy generating precinct design.
15.7	Advocate for changes to Exempt and Complying Development Code to ensure tree canopy cover can be increased in line with State directives.
15.8	Advocate for increases to BASIX and Section J of the National Construction Code in line with the State Government's net zero by 2050 aspirations.

VI. Penrith City Council

Penrith LEP 2010

The Planning Proposal sought to ensure the mitigation of the urban heat island effect is a major consideration for development. The new provision applies to development in all residential, business, industrial, special purpose and recreation zones as well as the RU5 Village and C4 Environmental Living zones.

See link to Penrith's LEP clause on Urban Heat:

https://legislation.nsw.gov.au/view/html/inforce/current/epi-2010-0540#sec.7.30

Penrith DCP

The DCP chapter supports the Penrith Local Environmental Plan 2010 Part 7 Additional Local Provisions, clause 7.30, the Penrith Local Strategic Planning Statement, and the Penrith Cooling the City Strategy and Penrith Resilience Action Plan in managing and mitigating the Urban Heat Island

Effect. This amendment introduced a new Urban Heat chapter into the DCP 2014 and provides new cooling measures below:

- Cooling with landscaping (i.e. Landscape design, green roofs and walls, soil volumes, tree planting specifications, irrigation and cooling with water)
- Cool colours and materials
- Cooling through building design
- Optimising mechanical heating and cooling.

The proposed amendments supplement the LEP 2010 with more detailed planning and design guidelines.

See link to Penrith's DCP chapter on Urban Heat Management:

https://www.penrithcity.nsw.gov.au/images/building-development/development/c14_urban_heat_management.pdf

Cooling the City - Planning for Heat Issues Paper

In 2021, Penrith City Council, in consultation with planners and industry stakeholders, developed the Cooling the City - Planning for Heat Issues Paper to identify gaps, improvements and enhancements to the current state government planning laws that would assist in achieving a cooler more liveable city for our community.

The issues/actions identified in the Issues Paper are provided below:

Issue 1: Greenfield subdivisions in Western Sydney are being built with minimal provision for tree canopy cover, exacerbating the urban heat island effect

Action 1.1: Advocate to the NSW Government to mandate urban tree canopy cover targets in any future release areas. These should be embedded in the master planning process.

Action 1.2: Advocate for the mandating of larger verge widths or alternate street designs within Department led DCP's of new greenfield subdivisions to facilitate canopy tree planting.

Action 1.3: Advocate for an amendment to the Exempt & Complying Code, requiring higher landscaped areas for smaller lot residential development, which is supported by a tree selection guideline.

Issue 2: Existing planning legislation managed by the NSW Government is facilitating development which contributes to the cumulative urban heat island effect in Western Sydney

Action 2.1: Advocate for a holistic review of BASIX and the Building Code of Australia (National Construction Code), ensuring urban heat is addressed to improve liveability outcomes.

Action 2.2: Advocate for an amendment to industry design guides to embed mitigation of the UHI effect in new developments.

See the full paper at the following link: https://www.penrithcity.nsw.gov.au/images/waste-environment/cooling_the_city/PCC_Cooling_the_City_-_Planning_for_Heat_Issues_Paper.pdf

VII. Waverley Council

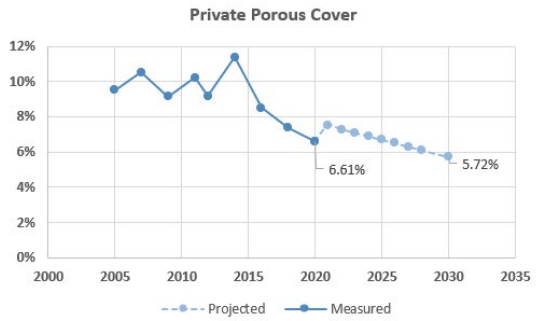
DCP amendments

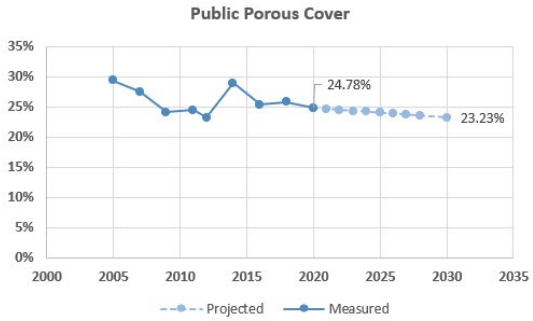
The following page shows the results of Waverley Council's aerial study, which shows loss of trees, plant-able and deep soil area over time due to development pressures, and the projection that by 2030 less than 5% of private properties in the LGA will have cooling capacity (i.e. 30% of the lots with Landscaped area – as per the Codes SEPP).

Subsequently Waverley made amendments to its DCP in 2022:

- New requirement to plant 2 new trees (min 75L pot size) for every existing tree of 3m or more in height that development removes
- Expansion of sites on the Habitat Corridor Map
- New requirement to obtain a Vegetation Clearing Permit to clear trees more than 3m in height, with more than a 3m canopy spread, or trees with a trunk diameter of more than 300mm

WAVERLEY
(2005 - 2030)





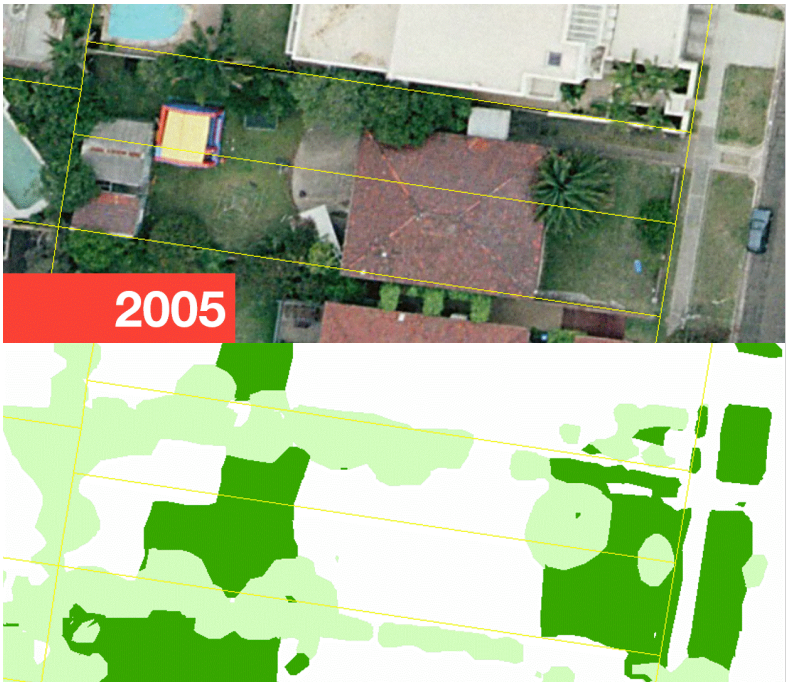


Figure 8. Waverley Council animation showing changes over time

VIII. Willoughby City Council

Recent LEP amendments

Recent LEP amendments which came into effect in June 2023 include introduction of an objective and clause to minimise urban heat impacts. Introduction of the urban heat clause was initially based on the WSROC model clause. For exhibition, DPE instructed Council to align with similar clause in Cumberland LEP 2021.

As the urban heat clause is relatively recent, it is too soon to be able to provide any feedback on implementation. The WLEP urban heat provisions are set out below:

1.2 Aims of Plan

(f) for housing - (iii) to support housing that maximises thermal comfort and minimises the impact of urban heat,

6.3 Urban heat

(1) The objective of this clause is to ensure new development incorporates effective design and ongoing operation to—

(a) reduce and remove urban heating from the environment, and

(b) protect community health and wellbeing.

(2) In deciding whether to grant development consent to development for the purposes of commercial premises, industries or residential accommodation, the consent authority must consider whether—

(a) the facade and roof of the proposed building and paved surfaces are designed to reduce adverse effects of solar heat on the surrounding land, including private open space and the public domain, and

(b) the awnings and eaves of the building are designed to provide shelter from the sun and improve public comfort at street level, and

(c) the heating, ventilation and air conditioning systems of the building are designed to minimise the release of heat in the direction of private open space and the public domain, and

(d) the development maximises the use of green infrastructure that is strategically designed and managed to support a good quality of life in an urban environment, and

(e) the development accommodates sufficient tree canopy, open space and deep soil zones to achieve urban cooling benefits, and

(f) the building is designed to achieve high passive thermal performance.

(3) In this clause—

deep soil zone—

(a) means the soft landscaped part of a site area used for growing trees, plants and grasses that—

(i) is unimpeded by buildings or structures above and below ground, and

(ii) provides opportunities for groundwater infiltration and canopy trees, and

(b) does not include basement car parks, services, swimming pools, tennis courts and impervious surfaces including car parks, driveways and roof areas.

solar heat means radiant heat contained in the full spectrum of sunlight.

For more information: Willoughby Local Environmental Plan 2012 - NSW Legislation

DCP provisions

A new section on urban heat was included in Willoughby's DCP in 2023 with examples of how the impacts of urban heat island can be reduced. The objective *to ensure new development includes appropriate measures to minimize the impacts of urban heat island effects* applies to all development types and occurs throughout the entire DCP.

For example, the following objectives and urban heat provisions are included in Part B and Part D:

DCP Part B – Residential Development

2.1.11 Urban heat

The objective is to reduce temperatures and create a resilient framework to mitigate the extreme impacts of urban heat by including appropriate measures to improve the health, comfort and wellbeing of residents. To reduce the impacts of urban heat island effects the development should:

- *a. use external materials, façade elements and glazing to limit solar reflectivity (this may include retractable shade structures, 'green' walls, and roofs, and/or rooftop solar panels)*
- *b. apply best practice water sensitive urban design (WSUD) principles*
- *c. reduce the extent of hard surfaces*
- *d. irrigate landscaped areas using non-portable water*
- *e. ensure landscaped areas include large trees with wide canopies*

4.3.7 Urban heat

Willoughby City Council encourages applying 'best practice' principles in the design and construction of buildings and other measures to reduce the impacts of urban heat island effects. This means increasing landscaped areas and the number of trees with large canopies, reducing hard surfaces, encouraging alternative and active transport, and applying water management, including water sensitive urban design principles. Buildings should also use external materials, façade elements and glazing to limit solar reflectivity to minimise urban heat impacts. This may include retractable shade structures, 'green' walls and roofs, and/or rooftop solar panels. Roofs should achieve these Solar Reflectance Index (SRI) values:

- *a. for roof pitch <15 degrees, 3-year SRI minimum of 64*
- *b. for roof pitch >15 degrees, 3-year SRI minimum of 34*
- *c. for terrace areas, 3-year SRI minimum of 38*

Notes:

- Plans must illustrate the SRI values of all roof surfaces.
- Plans do not need to include an SRI value for areas where photovoltaic (PV) panels are mounted flat on the roof

DCP Part D Commercial Development

1.2 Objectives

d. ensure commercial development maximises thermal comfort and minimises urban heat impacts in the interests of health and wellbeing

4.1 Building design

4.1.2 Controls

e. developments should use materials with a low solar reflectance index (SRI) and incorporate shade structures to reduce urban heat island effects

Link to Willoughby DCP: Development Control Plan (DCP) | Willoughby City Council (nsw.gov.au)

Attachment B – examples of standard provisions for urban heat

LEP provision

Suggested wording for a standalone LEP urban heat provision is included below (reference: Urban Heat Planning Toolkit, page 42).

This template provision has been used by several councils to inform their LEP review.

Suggested Local Provisions: Urban Heat

1) The objective of this clause is to ensure new development incorporates effective planning and design to reduce the impacts of urban heat, to help the community survive heatwaves and thrive in a warmer climate.
2) This clause applies to all developments in residential, business [employment], industrial, recreation, special purpose and environmental living zones.
3) Before granting development consent, the consent authority must be satisfied that:
    a. The development makes adequate allowance for ***green infrastructure***, including an appropriate contribution to tree canopy cover targets adopted by Council. [This means allowing for sufficient deep soil and plantable area to encourage root development and minimise conflicts with utilities];
    b. Building roofs (other than green roofs) are designed as ***cool roofs***, wherever they are not designed as green roofs or covered with solar panels;
    c. Building exteriors are designed to minimise heat impacts in their immediate surroundings [, particularly where these spaces are frequented by people. This includes solar radiation reflected from façades, heat absorbed and re-radiated from walls and heat ejected from heating, ventilation and cooling systems];
    d. Buildings are designed to achieve high ***passive thermal performance*** and reduce reliance on air conditioning [to maintain comfortable and safe indoor conditions, even during heatwaves];
    e. Public and private outdoor spaces that are accessible to residents, workers or the general public, including gardens, courtyards, parks, plazas and streetscapes, are designed as ***cool spaces***;
    f. The development makes a contribution, proportionate to its scale, to renewable energy supply and/or storage, which will reduce the peak demands on the grid during heatwaves; and

g. The development has access to an appropriate sustainable supply of non-potable water (e.g. rainwater, harvested stormwater or recycled water) to enable irrigation for cooling, even at times when drinking water use is restricted.

4) In this clause:

a. ***Green infrastructure*** includes all types of vegetation found in urban areas, including natives and exotic species, remnant and planted vegetation, trees, shrubs, grasses and groundcovers, vegetation in parks, streetscapes, public and private domain. It includes elements such as green walls and roofs, rain gardens, wetlands and swales, productive, ornamental and native gardens, trees, turfed areas, bushland and riparian vegetation.

b. ***Cool roofs*** use materials of high solar reflectivity index (particularly in the infrared and near infrared spectrum, >80 SRI) and/or high thermal emittance (they easily re-radiate any absorbed solar energy).

c. ***Passive thermal performance*** is achieved by designing with passive heating/cooling measures (such as orientation, natural ventilation, natural cross ventilation, cool materials, external shading, glazing and appropriate use of thermal mass), to reduce the reliance on mechanical heating or cooling to maintain thermal comfort.

d. ***Cool spaces*** in the outdoor environment (in both the public and private domain, including parks, streetscapes, plazas/public squares, private gardens, courtyards, balconies, outdoor work areas) are designed to implement principles that maximise human thermal comfort in outdoor environments, including:

i. Maximising summer shading (e.g. via shade structures or tree canopy);

ii. Minimising heat reflected from building walls and façades into pedestrian gathering or circulation areas;

iii. Minimising heat input to pedestrian circulation areas from sources such as vehicles and building HVAC systems;

iv. Maximising the amount of water retained in the landscape, including both rainfall intercepted and retained in soils, and the use of irrigation (using sustainable water supplies such as rainwater, harvested stormwater or recycled water) to maintain healthy vegetation and maximise evapotranspiration;

v. Incorporating evaporative cooling systems such as water features or misting fans to create particular cool zones; and

vi. Using permeable paving where possible and prioritising the use of cool paving materials wherever glare is not a constraint and there are potential cooling benefits.

DCP provision

The below outlines suggested wording for standalone DCP objectives and design principles. Please refer to p.48 the Urban Heat Planning Toolkit for further information and considerations.

Urban Heat

In the LGA, all development will be required to implement design principles that minimise the impacts of urban heat. This means that each development should minimise its carbon emissions, reduce its peak demand on the electricity grid and minimise its contribution to the urban heat island effect; as well as being designed to ensure that both indoor and outdoor spaces are designed to stay as cool as possible in hot weather.

The requirements for urban heat mitigation and the information required to support a Development Application varies for different types and scales of development.

Objectives:

- To reduce carbon emissions from the development, considering both construction and operational emissions.
- To reduce peak demand on the electricity grid and support a robust electricity network, by improving energy efficiency and installing solar panels.
- To reduce the development's contribution to the urban heat island effect, by minimising hard surfaces, using cool materials, maximising landscaped area, and retaining water in the landscape where it is available for evapotranspiration.
- To design homes for high passive thermal performance, so that they stay as cool as possible through heatwaves, and maintain habitable conditions even in the event of an extended power outage.
- To design non-residential buildings for high passive thermal performance, so that they remain comfortable for workers and visitors in hot weather, while also minimising energy demands. Prioritise buildings (or parts of buildings) which are open to the public and those where people work.

- To design outdoor areas that are accessible to residents, workers or the general public to stay as cool as possible during hot weather, so that people can still work, socialise and recreate outdoors and also use active transport modes.

Design principles: buildings

- Design buildings for high passive thermal performance, to reduce reliance on energy for cooling (and heating).
- Install energy-efficient fittings and appliances.
- Install or connect to renewable energy systems, to offset energy demands and reduce peak electricity demands.
- Use cool roofing materials, with a high Solar Reflectance Index (SRI). Green roofs are also encouraged, particularly where there is a need to minimise glare from roofs.
- Limit the solar reflectivity of glazed façades, and shade reflective façades with vegetation and/or architectural features.
- For external walls, minimise the use of thermally massive materials like concrete that absorb energy and stay warm, re-emitting heat into outdoor areas.

Design principles: outdoor areas

- Design outdoor spaces to stay cool in hot weather, considering orientation, including as much shade as possible, and providing irrigation to landscaped areas.
- Prioritise these design measures in areas frequented by people, including town centres, transport nodes, active transport routes.
- Shade paved surfaces and walls where possible, also considering solar access in the cooler months.
- Consider cool paving (high albedo and/or high thermal emittance) or permeable paving. Although these materials are not suitable in all situations, they should be used wherever possible. Use cool paving wherever glare is not a constraint and there are potential cooling benefits. Use permeable paving where traffic loads are light and where there is an opportunity for rainfall to soak into soil below the pavement.
- Maximise landscaped area within the development. Within landscaped areas, maximise soil volumes, and plant trees that will grow to have large, dense canopies. Also include understorey plantings.
- Provide irrigation to landscaped areas, to support healthy vegetation and enable evapotranspiration, which has a cooling effect.

- Where an irrigation system is not feasible, provide passive irrigation – enable runoff from adjacent hard surfaces to soak into landscaped areas.
- Include features that store water in the landscape – for example rain gardens, wetlands and ponds. Also consider the use of fountains, misting fans or water play features to create particular cool zones in the landscape.
- Connect irrigation systems and water features to a sustainable supply of non-potable water (e.g. rainwater tank, stormwater harvesting scheme, recycled water) so that a water supply is more likely to be available for cooling, even in times of drought and restricted mains water use.

Development controls:

- All development must consider the design principles above.
- All development needs to meet the cool roof performance standards [REFER TO SECTION 7.3.2 of the Planning Toolkit].
- Development within the CBD / B3 and B4 zones / [other defined areas] needs to meet the cool façade performance standards [REFER TO SECTION 7.3.2 and APPENDIX A of the Planning Toolkit].
- All development needs to adhere to the controls for heat emitted from HVAC systems [REFER TO SECTION 7.3.2 AND APPENDIX A of the Planning Toolkit].
- There are other requirements listed elsewhere in this DCP that are also relevant to meeting the urban heat objectives above:
    - Energy efficiency in non-residential buildings
    - Rooftop solar power
    - Landscaped areas (including minimum total areas, minimum deep soil areas, minimum irrigated areas)
    - Trees (including tree protection, tree replacement and requirements for new trees)
    - Alternative water supplies for non-residential development
    - Water sensitive urban design
    - Electric vehicles.
- For residential buildings, thermal performance and energy efficiency standards are set within BASIX.
- For non-residential buildings, thermal performance standards are defined in the National Construction Code, for the relevant building type.

Attachment C – examples of current development outcomes

The following pages include real-world examples of outcomes of the current planning system which exacerbate the issue of heat.

Liverpool City Council

Complying Development Terrace:

Address:	39 Bangalow Avenue, Chipping Norton NSW 2170
Application number:	CD-1125/2022
Lot Size:	670.3m²
Units:	4 units

Issues:

- Front setbacks are dominated by hardstand area for driveways
- Little opportunity for landscaping in the front and side setbacks, and rear backyard;
- Previous large deep soil areas and significant trees removed and replaced with hard surface area after CDC approval.

Table 4. Complying Development Terrace Development

Before Redevelopment:

After Complying Development:

Complying Development Terrace:

Address:	17 and 19 Thompson Avenue, Moorebank NSW 2170
Application number:	CD-1261/2022 and CD-674/2023
Lot Size:	677m² and658m²
Units:	3 and 4 units

Considerations:

- Front setbacks are dominated by driveways and hard stand areas.
- Four dwellings on <700sqm lot size results in overdevelopment of irregular shaped site
- Little opportunity for landscaping in the front setback
- The internal layout of the units is narrow and does not provide for desired amenity especially with regard to ventilation.
- Rear yards provide little opportunity for practical use of space, tree planting or deep soil.

Table 5. Complying Development Terrace Development

Before Redevelopment:

After Complying Development:

Complying Development Terrace:

Address:	30 Hermitage Crescent Cartwright NSW 2168
Application number:	CD-268/2023
Lot Size:	677m²
Units:	3 and 4 units

Considerations:

- Front setbacks are dominated by hard surface.
- Large scale tree removal with tree no replacement.

Table 5. Complying Development Terrace Development

Before Redevelopment:

After Complying Development:

Development in Growth Area Suburbs

Figure 9. View in street in Middleton Grange within the Liverpool LGA.

Figure 10. Aerial image of medium density residential in Austral with dark colour roofing and minimal tree planting and deep soil within laneway facing garages.

Residential Flat Building:

Figure 11. High density buildings within the Liverpool Local Government Area with dark colours attracting high urban heat.

Blacktown City Council

Complying and Exempt Development SEPP and the Greenfield Housing Code

Greenfield areas such as the suburbs Marsden Park and Riverstone in Blacktown City's Northwest, demonstrate the most severe urban heat island effects in Blacktown City. We anticipate our population to grow from 415,000 to 620,000 by 2040. Most of our growth will occur in the Northwest Growth Area and is subject to the Greenfield Housing Code. The current design requirements under the Greenfield Housing Code amplify the urban heat island in Blacktown City for the reasons outlined below.

Reduced tree canopy

- Minimum lot sizes: The Code sets minimum lot sizes that, while promoting housing supply, can limit space for substantial trees on individual properties. Lots between 200 -250m2 require a minimum landscaped area of 10%. This makes it difficult to retain enough deep soil for a mature tree (5m+) to provide shade. Rear setbacks requirements of 0.9m for small lots less than 900m2 mean that there is no room to grow a tree in the backyard.
- Reduced landscaping requirements: The focus on fast-tracking development can lead to less stringent landscaping requirements or less emphasis on tree preservation compared to Council development assessment pathways. For lots smaller than 300 m2, a 20% canopy and deep soil target should be required.

Emphasis on detached housing

- Isolated buildings: Detached dwellings have less opportunity for mutual shading compared to more compact urban forms. There should be an emphasis at the Indicative Layout Plan stage to create housing diversity that increases shading.
- More impervious surfaces: Larger driveways and greater overall paved surfaces associated with detached housing contribute to heat absorption and re-radiation. To mitigate this, driveways should have a solar absorptance rating of less than 0.5.

Limited flexibility for heat mitigation

- Prescriptive standards: The complying development code relies on fixed checklists, providing less room for case-by-case assessment and dynamic solutions tailored to heat reduction. Performance-based assessments of urban heat that combine multiple design interventions could result in better outcomes. An example would be requiring 70% of a lot area to be either landscaping, cool roof, green roof or a water feature to mitigate the urban heat island effect.

Limited consideration of site-specific conditions

- Blanket approach: Greenfield development often applies standard housing typologies across large areas. Marsden Park is an example of how repetitive detached development can result in poor environmental design including housing layout and orientation based on local sun angles, wind patterns, and existing vegetation. We need a guide on how urban design can consider urban heat during the early stages of the planning process (Indicative Layout Plan).

Dark roofs and the urban heat island

Case study: Marsden Park

Utilising the NSW Green Infrastructure UI tool demonstrates the effect of cool roofs versus dark roofs on surface temperatures. A case study in Marsden Park shows how cool roofs on the same street are as much as 7 °C cooler than dark roofs.

The below table represents min, max and average surface temperatures for development on streets facing onto Northbourne Drive and Newington Glade in Marsden Park.

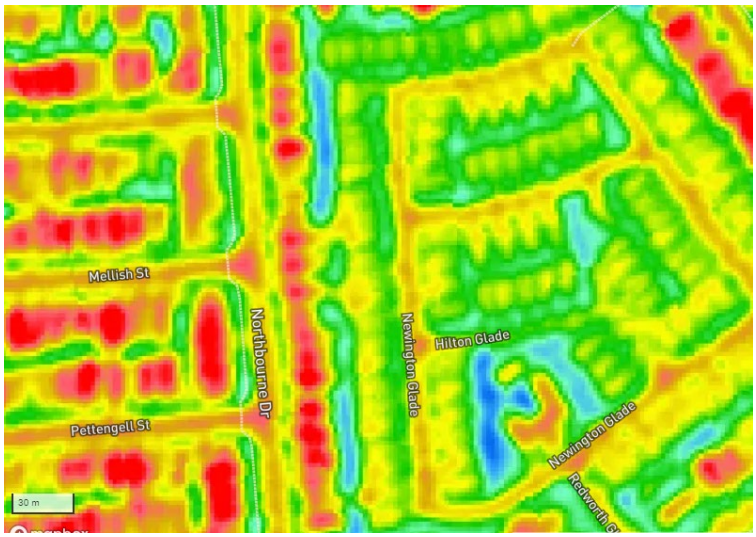
Street with 'cool roofs'	Street with 'dark roofs'
• Min: 19.9 °C • Max: 30.0 °C • Mean: 24.3 °C	• Min: 20.4 °C • Max: 37.1 °C • Mean: 26.9 °C

Refer to the images on the next page for a comparison.

Aerial imagery

Source: NSW Green Urban Infrastructure Interface 2022

Thermal imagery



Source: NSW Green Urban Infrastructure Interface 2022