AdaptNSW Webinar

Adaptation in Action: Heat risks and opportunities in your Local Government Area

Department of Planning, Industry and Environment

AdaptNSW Webinar

Adaptation in Action: Heat risks and opportunities in your Local Government Area

Esther Bailey
Director
Climate Resilience and Net Zero Emissions

8 December 2021

Department of Planning, Industry and Environment

Acknowledgement of Country

We acknowledge that today we meet on many Aboriginal lands. We acknowledge the traditional custodians of the lands and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work.
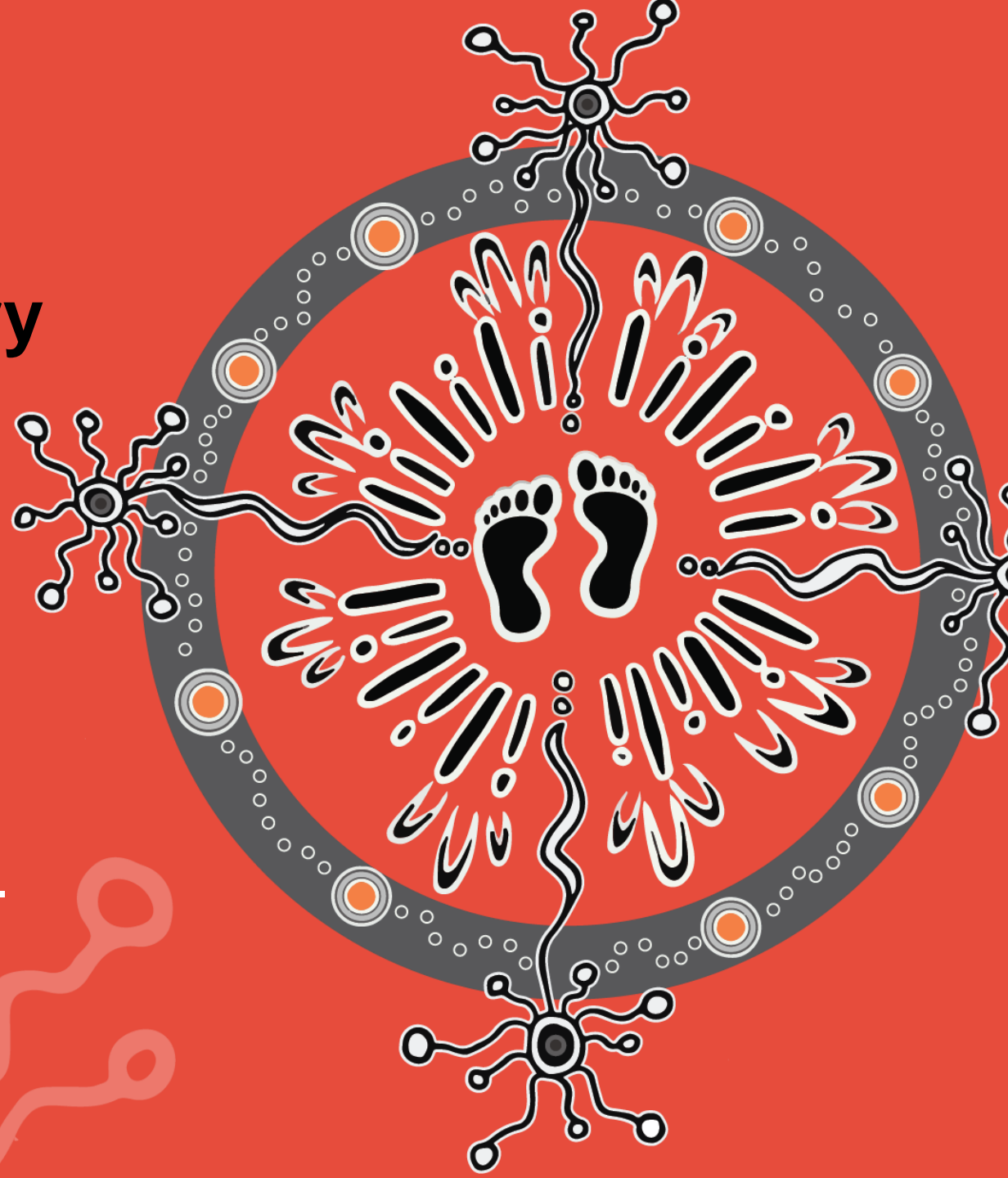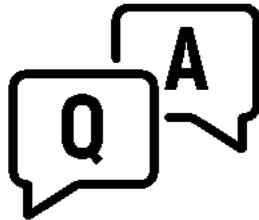
Meeting rules and interaction
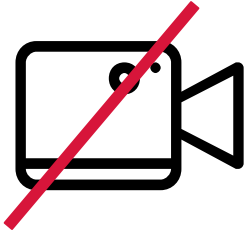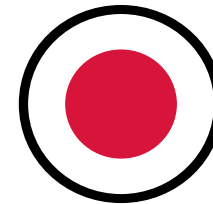
Turn off your camera

Mute yourself

Use the chat box

Dedicated Q&A time

Presentation will be available

Todays webinar will be recorded

Increasing Resilience to Climate Change Grants

Delivered in partnership with LGNSW

Focus on extreme heat is timely

Snapshot of innovative and practical projects

Inspiration to take action on climate change adaptation

Turn Down the Heat

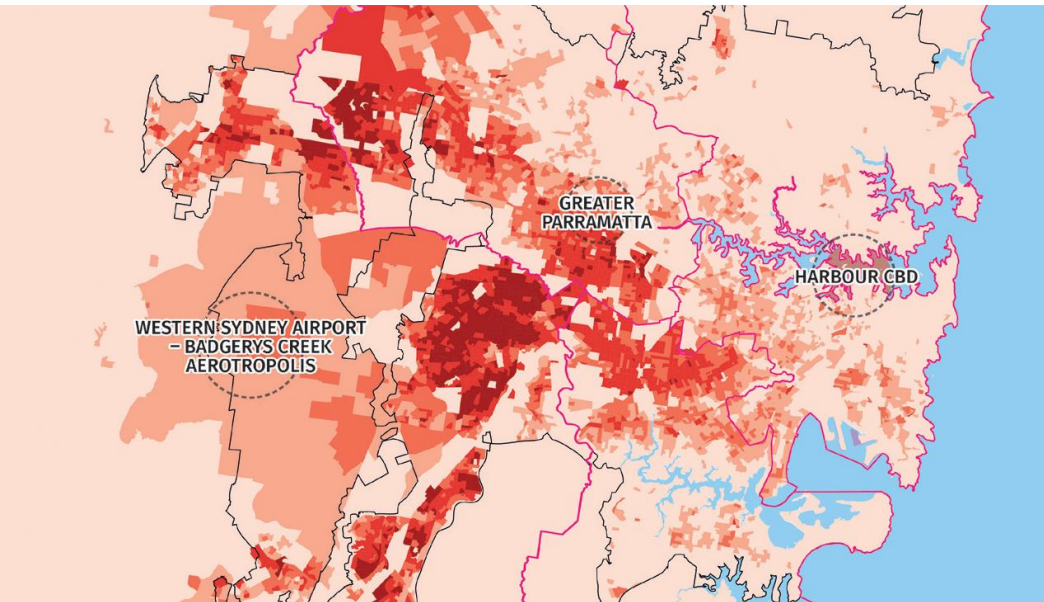Working together to create cooler more resilient communities

Cool Suburbs

The challenge | community impacts

Vulnerability to heat

Greater Sydney Commission (2018). Western District Plan

In a 2020 survey of Western Sydney residents, the following heatwave impacts were reported

80% suffered loss of sleep

58% worried about electricity costs

34% felt distressed or mentally stressed

32% lost power to their home

28% felt unwell or sought medical advice

24% had transport disrupted

Survey conducted by WSROC in May 2020. Respondents were from the general population, and most were not considered at-risk individuals.
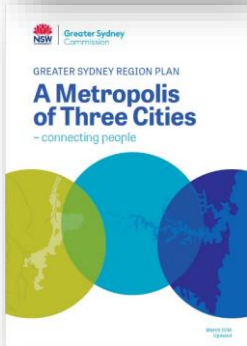
TURN DOWN THE HEAT

Heat and the policy context | research, targets, action

Turn Down the Heat

Developed in collaboration with 55 organisations across planning, health, infrastructure, research, community, industry. Identifies targets, strategic drivers and actions.

Greater Sydney Region Plan

Objective 38: "heatwaves and extreme heat are managed"

Strategy 38.1: "Mitigate the urban heat island effect and reduce vulnerability to extreme heat"

Resilient Sydney

"Heat is Sydney's top shock and biggest risk"

Place based research:
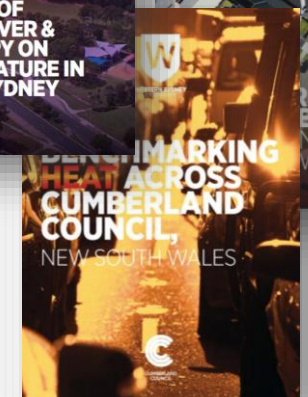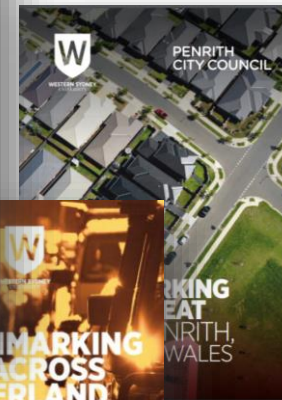
- Urban heat can be mitigated to an extent – focus on reducing impact

- Extreme heat is life threatening – we need to adapt and respond

- A resilience approach is needed

Urban heat management | a resilience approach

A **resilience approach** will facilitate urban design that recognises and reduces the risks of urban heat.

The approach is applied in four ways:
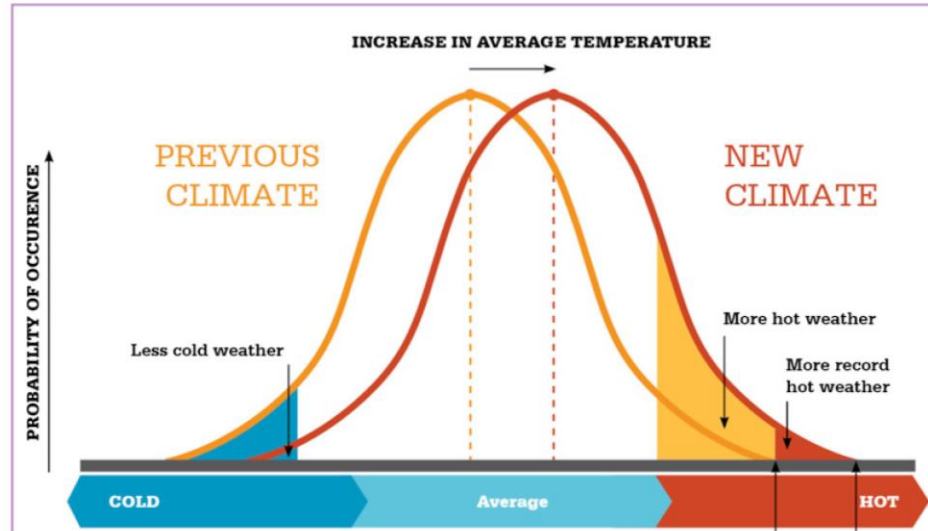
Turn Down the Heat | progress to date

Strategy & Gap Analysis
Recommendations for coordinated governance

Heat Smart
- Recommendations for heatwave management and response
- Community awareness and preparedness building

Governance and coordination

Emergency planning and community resilience

Design and plan to cool the build environment

Cool Suburbs
Voluntary decision support and design guidance tool
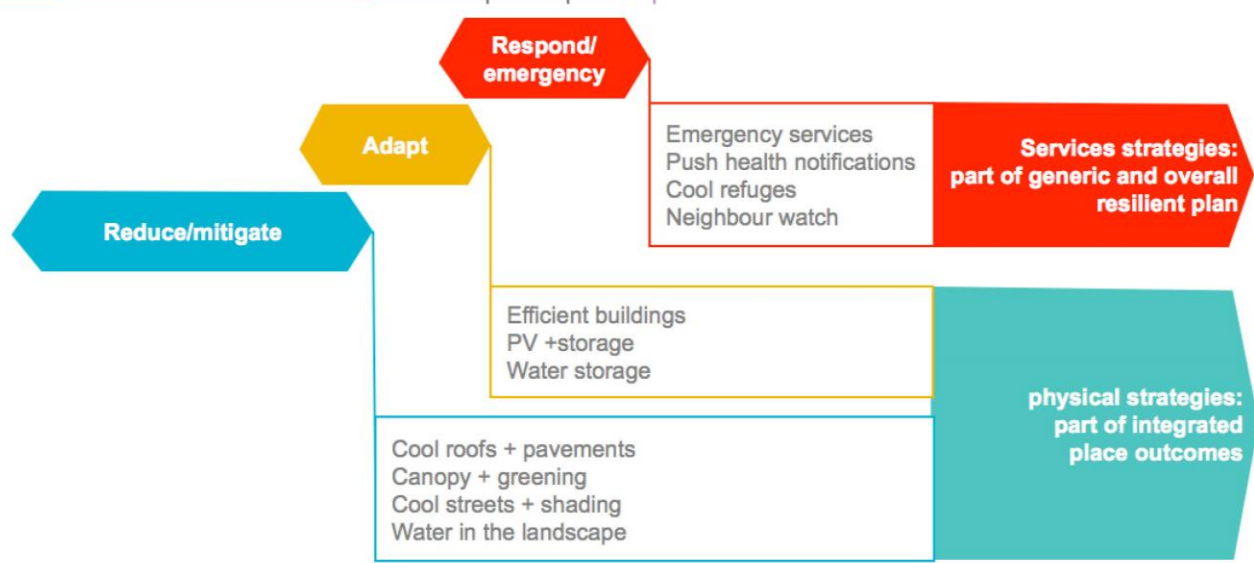
Urban Heat Planning Toolkit
Guidance for councils to address heat in their LEP and DCPs

Future proofing residential development
Assess performance of compliant dwellings against future climate projections

Climate resilient street trees
Species selection and passive irrigation for resilient urban canopy

Cool Suburbs

A resilience approach to landuse planning and design

Cool Suburbs | aim

A decision support tool to encourage and reward urban design changes that reduce urban heat impacts across multiple scales.

Cool Suburbs | project team
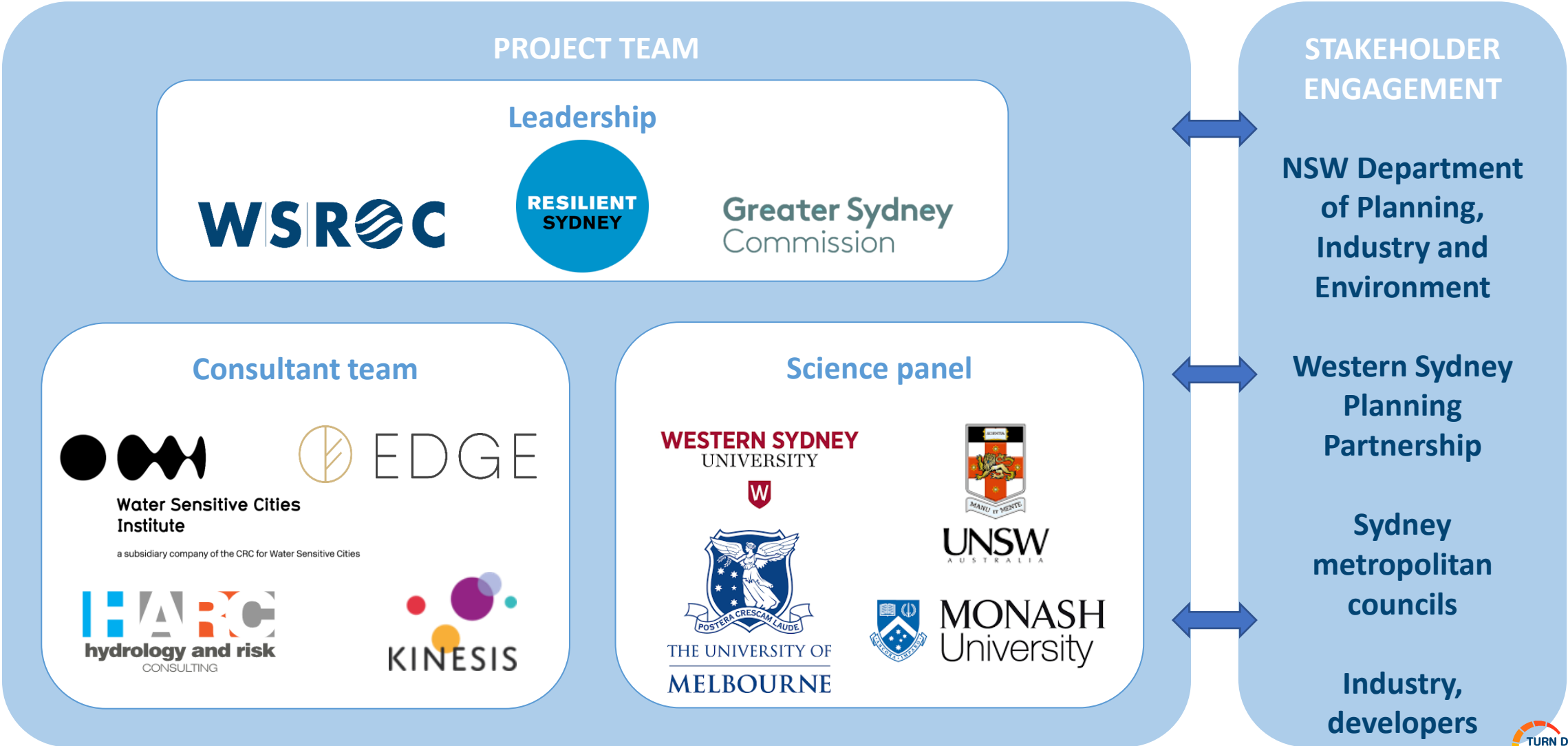
Tool development process | Three key steps

1. Reviewing the science

- Review the evidence for the most effective interventions to contribute to urban cooling, adapting and responding
- Translate findings into key metrics

2. Understanding user and business needs

- Evaluate business and user needs for the tool to determine workflow
- Ensure stakeholder requirements are met
- User persona development

3. Tool development

- Develop 'design support tool' that will provide a rating of the resilience of a place to extreme heat compared to 'business as usual'
- Test and refine tool prototype
- Finalise

TURN DOWN THE HEAT

Cool Suburbs | tool components

- Six categories

- 28 credits

- Place based: weighting and credit selection determined by local climate and physical characteristics

First iteration of the Tool scheduled for completion December 2021

Urban Design
- Wind paths
- Wind buffering
- Street canyons
- Open space
- WSUD

Cool Streets
- Shade & canopy
- Evaporative cooling & Irrigation
- Cool pavement
- Porous pavement

Cool Homes
- Site coverage
- Site shade
- Site irrigation
- Passive cooling
- Cool roofs

Cool Buildings
- Site coverage and shade
- Site irrigation
- Passive cooling
- Cool envelope
- Alternative energy supply

Cool Parks
- Shade
- Evaporative cooling & irrigation
- Cool pavement
- Porous pavement

Innovative Tech
- New technology
- Data collection and analytics

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Cool Suburbs | use outside of Western Sydney?

- There are at least four credits that need to be tailored based on local geography

- The remainder of credits are designed to be applicable to all geographies

TURN DOWN THE HEAT

Cool Suburbs | timeline

Science translation

Tool prototype

Demonstration

Tool user testing

Finalise the tool

Stakeholder consultation

Expert science panel reviews **Oct 2020**

User needs interviews (Local/state government & Private sector **Oct/Nov 2020**

Prototype demonstration (public and private sector)
To provide feedback on the prototype **Apr 2021**

User testing – selected public and private sector end users **Oct 2021**

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Cool Suburbs | three use cases

1. Development and design

2. Assessment and approval

3. Policy and planning

Councils

| Education, awareness and resident engagement | Evaluating Development Applications | Council social & infrastructure developments | Setting goals, requirements and targets |

State government

| Understanding broader scale impacts of development on the resilience of places and communities to extreme heat | Assessment of compliance – SEPPs, LEPs, DCPs and Das |

Developers

| Demonstration of benefits – marketing and customer engagement | Assessment of compliance – SEPPs, LEPs, DCPs and DAs | Identification of good/best practice to support design – early intervention |

TURN DOWN THE HEAT

Cool Suburbs | roadmap development approach

Roadmap development is informed by:

- User interviews

- Prototyping workshop

- User testing

Stakeholder summary

Cool Suburbs | key learnings

1. The Tool provides a clear rationale and evidence base for what is required to achieve a cool suburb

2. There will be a need for ongoing science rationale support as the science continues to mature and tool users question interpretation of the science

3. User testing indicates that a number of the criteria may be difficult to achieve, including for developments that are compliant with current planning policy

4. Feedback suggests multiple audiences for the tool in the future, each requiring a different functionality

5. A governance structure is required to support decision making regarding upgrades to the Tool

CST Roadmap | three key phases

Phase one:
Cool Suburbs Tool development

Phase two:
Opportunities for immediate impact and exploring the business case

Phase three:
Defining high impact future pathways

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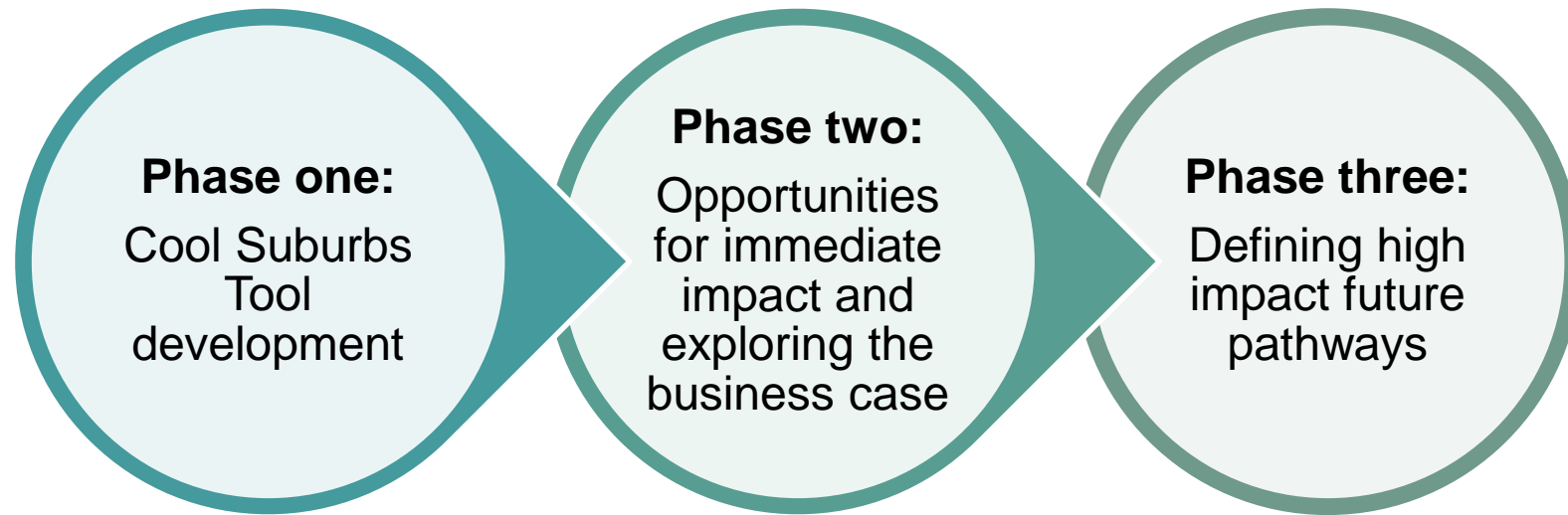
Cool Suburbs

Tool demonstration

Thank you

Questions?

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Goulburn Recreation Area

Heat Smart Showgrounds Project

Priority Improvements Undertaken

▶ The final Climate Change Resilience Study report from our specialist consultant provided prioritised recommendations for infrastructure and procedural improvements designed to protect both humans and animals from heat related impacts.

▶ The project funding provided the means to implement a number of the priority improvements recommended by the study including:

  ▪ Installation of vents, fans and mechanical whirly birds in the Poultry Pavilion;

  ▪ Installation of fans in the Peden Pavilion;

  ▪ Installation of a misting system in the Harness race day stables;

  ▪ Installation of animal welfare signage across the site;

  ▪ Planting of shade trees in site locations identified as significant heat islands which also attract high patronage.

Challenges

▶ The scope and delivery of the project presented a number of challenges including:

- Site complexity – the 45ha Recreation Area has a range of interconnecting environments which support a multitude of users with varying activities;

- Infrastructure condition – the Recreation Area has considerable variation in the age and functionality of various structures which host the many activities at the site;

- Covid19 impacts - travel restrictions and lockdowns had an unanticipated impact on the delivery of various components of the project; and

- Varying stakeholder opinion – the range of activities held at the site meant some input from users was centric to specific activities rather than addressing a whole of site perspective.

Benefits and Opportunities

▶ The Heat Smart Showgrounds Project delivers a number of opportunities moving forward including:

- informing the ongoing management of events at the Recreation Area for activities which are undertaken during periods of high temperatures (above 35 degrees) which will improve the onsite safety and enjoyment for participants, patrons and animals;

- providing an evidence base for future funding opportunities to further improve facilities at the Recreation Area;

- improving the comfort of volunteer/s who are involved in supporting activities at the site with a flow-on affect to increase volunteer numbers for future events;

- providing prescriptive solutions for infrastructure modification and improvements which can be adopted for other community facilities owned by Council to mitigate against hot weather impacts; and

- providing a 'model project' to guide efforts for other showgrounds across NSW which need to improve resilience against Climate Change impacts.

Outcomes

▶ The Climate Change Resilience Study has been endorsed as a key appendix to the updated Goulburn Recreation Area Plan of Management which was completed in 2021. This study is a keystone document for the future management and development of the site in relation to mitigating Climate Change impacts in relation to increased hot weather events. The study provides blueprint for the delivery of priority improvements, from the short to long term, which management can utilise as directional information to support ongoing infrastructure improvements.

▶ Recommendations from the study relating to adaptive management processes, such as event timing, the trialling of night events, and the use of site signage towards issues such as recognising and mitigating heat stress in humans and animals, forms a critical resource for progressive, flexible and sustainable management practices.

Outcomes continued..

▶ The project successfully concluded with the delivery of a range of infrastructure improvements for the Recreation Area aimed to reduce the impacts arising from increased hot days above 35 degrees which will affect events and operations undertake at the site into the future, including:

- increasing shade across the site from a program of tree plantings for areas identified by the study as being significant heat islands with high patronage form users;

- installation of side air vents, fans and mechanised whirly birds to improve air flow and reduced residual air temperature for the poultry pavilion;

- installation of fans improve air flow and reduced residual air temperature for the Peden pavilion;

- installation of a misting device in the stables area to be used for cooling of horses during periods of hot weather; and

- Installation of animal welfare signage to remind people of the signs of heat stress in animals and how to prevent these occurring.
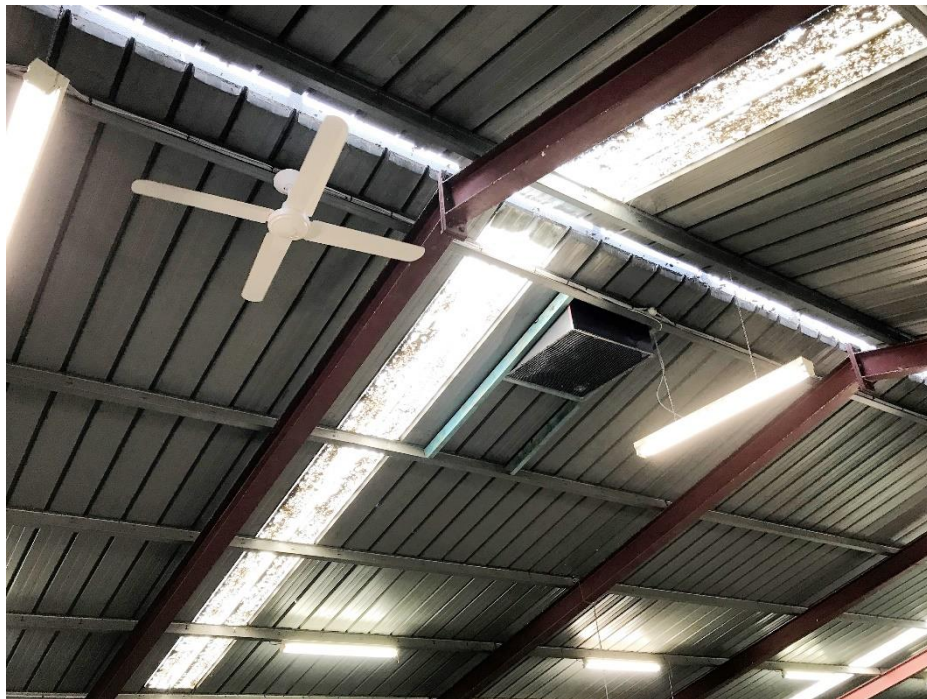
Tree Planting

Animal Welfare Signage

Fans in the Peden Pavilion

Vents, fans and mechanical whirly birds in the Poultry Pavilion

Q&A

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Cooler Places in a Warming Climate
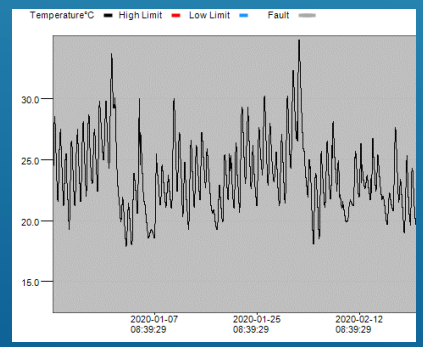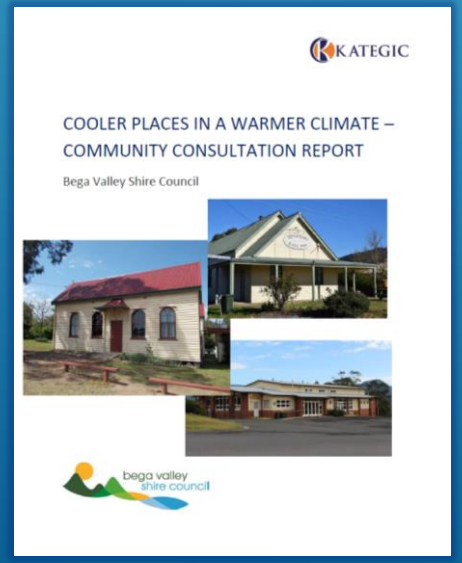
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Q&A

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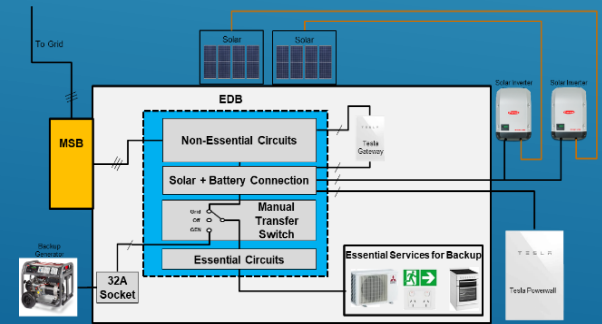**Adaptation in Action: Heat risks and opportunities in your Local Government Area**

8 December 2021

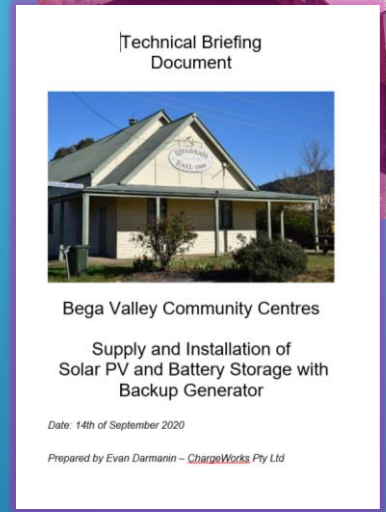Department of Planning, Industry and Environment

VIDEO

Lessons Learned

- We were surprised which materials were hottest and which were coolest – its not always what you expect

- Placemaking takes time but talking to the community allowed us to better meet their needs

- People are pragmatic, their preferences for shade varied depending on their age

- Replacing black asphalt with plain concrete and ground cover vegetation had a measurable and rapid cooling effect

BERESFORD AVENUE:
ROSE-CHART - MIDDAY

33.9°
AIR TEMP
MIDDAY

KEY
SURFACE TEMP. (°C)
AIR TEMPERATURE (°C)

MATERIALS
HARDSCAPE (GROUND)
BITUMEN PATH
CONCRETE PATH
CONCRETE GUTTER
BITUMEN ROAD
GLAZED TILE
HARDSCAPE (BUILT)
TIMBER SEAT
METAL SIGN POST
GLAZED TILES
PAINTED BRICK
BRICK WALL
BRICK GARDEN PIT
BLACK GARDEN PIT
VEGETATION
GRASS
BARK

LOCATION 5. BERESFORD AVE, BERESFIELD

City of Newcastle

UoN's data analysis shows we successfully cooled the site

2017

Google

2021

Challenges

- A collaborative placemaking approach takes additional time, money and resourcing – it needs management support

- Disruption to project management resourcing and Covid slowed delivery

- Designing and manufacturing a bespoke shade shelter was expensive (however the shelter can be reused elsewhere when the tree grows)

- Installation of the shelter was delayed and 2021 temperature measurements were undertaken before the shade shelter was installed

- Tree shade is the most cost effective way to cool a site, but is slow to develop

Resources

- Smart Trees: Resilience Strategies to Combat Urban Heat Island Effect Newcastle NSW (UoN 2019)

- Draft Beresfield Local Centre: Urban Heat Measurements Report 2021

- Shade shelter construction detail

- Useful links:

newcastle.nsw.gov.au/beresfield

newcastle.nsw.gov.au/have-your-say/projects/beresfield-bring-this-space-to-life
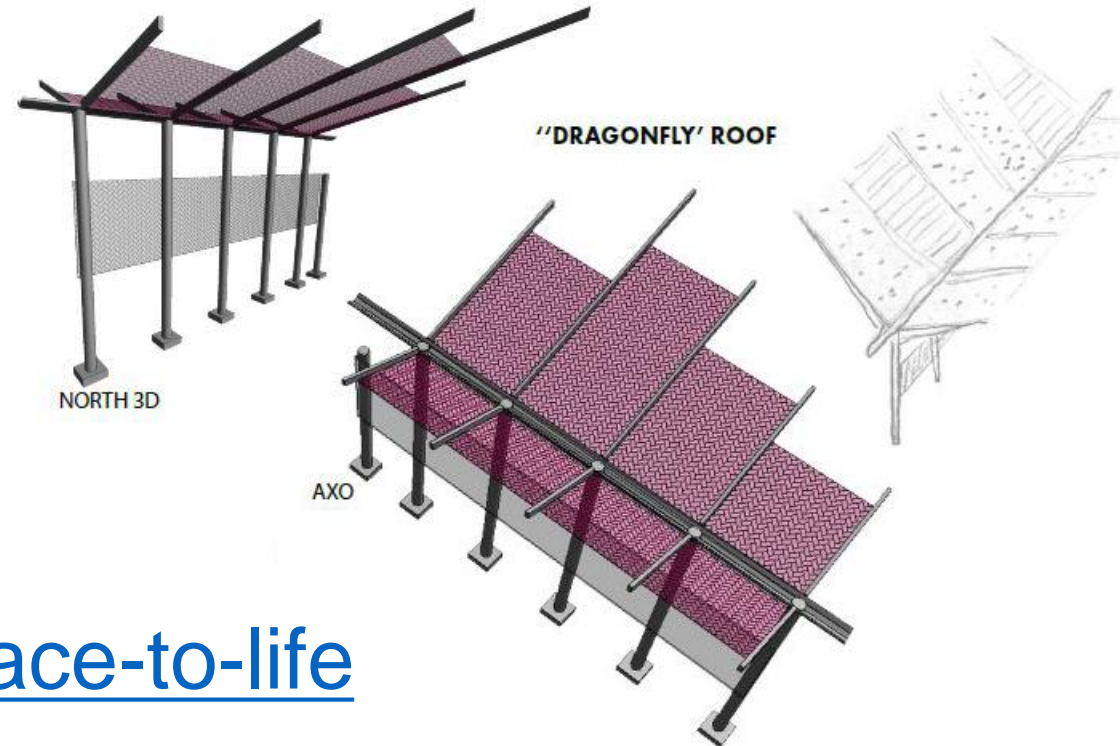
''DRAGONFLY' ROOF

NORTH 3D

AXO

Q&A

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Department of Planning, Industry and Environment

VIDEO

Five Key Milestones

Heat map the Queanbeyan-Palerang local government area

Develop an urban forest and cooling strategy
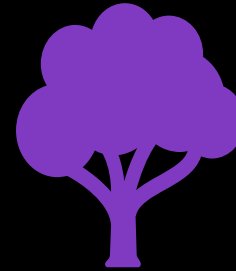
Assess the climate change vulnerability of current urban trees- identifying which trees to continue to plant in the urban environment
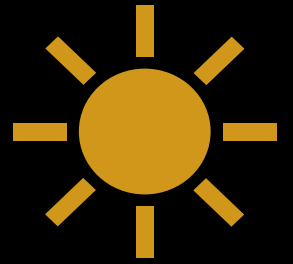
Identify suitable future climate ready trees which currently do not grow/are not established in the region

Experimental pilot plantings of potentially suitable future climate ready trees

MILESTONE 1 SURFACE HEAT MAPPING

SURFACE HEAT MAPPING

- Hot Day Surface Temperature Map
- Nighttime Surface Temperature Map
- Cold Day Surface Temperature Map

WHY

- Identify urban heat islands

- Analyse how heat is distributed within the landscape

- Understand the average surface temperatures of different land use types

Data was acquired from the thermal infrared sensor (TIRS) abord the Landsat 8 satellite platform- **30 metre by 30 metre resolution**
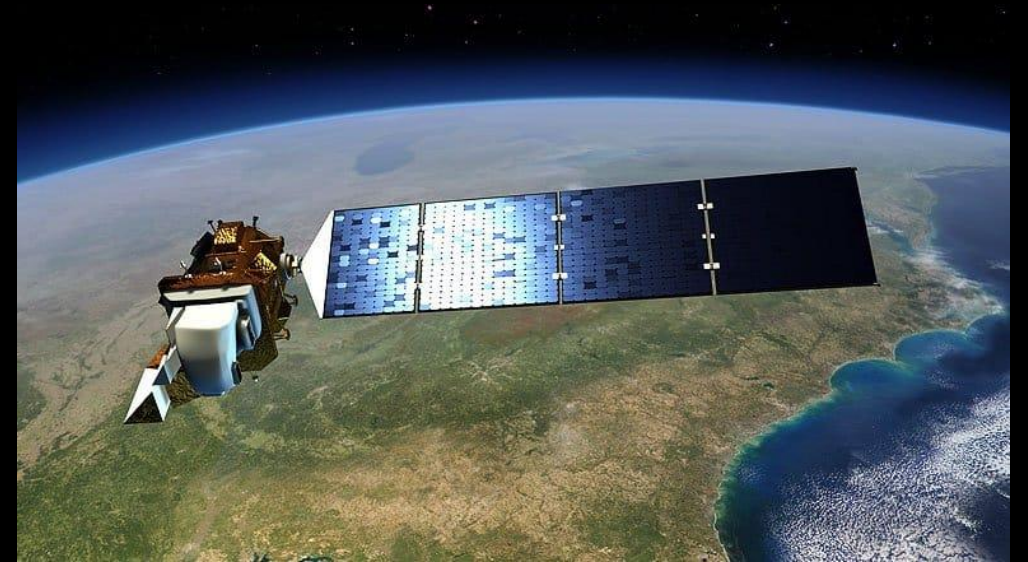
A SNAPSHOT IN TIME

1. Accumulation of heat in urban areas

2. Tallaganda National Park highlighting the cooling influence of vegetation

3. Buildup of heat within grazing paddocks and rural lands with very few trees and dry grass

QPRC Hot Day Surface Temperature Map

Bungendore

Queanbeyan

Googong

Braidwood

N

10 km

Thermal composite of two Landsat images acquired Dec 28th, 2018 and Jan 29, 2019

Hot Days Surface Temperature Map
Major Roads
Council Boundary
Urban Boundary
Surface Temperature
High : 40 °C
Low : -0 °C

QPRC Nighttime Surface Temperature Map

Bungendore

Queanbeyan

Googong

Braidwood

N

10 km

Thermal Landsat image acquired Dec 17th, 2019

Nighttime Surface Temperature Map
Major Roads
Council Boundary
Urban Boundary
Surface Temperature
High : 20 °C
Low : -10 °C

Urban Heat Island Area

99.77% 99.01% 91.46%

75.10% 58.33% 64.00%

9.56% 0.00%

Googong Bungendore Queanbeyan Braidwood

Average Surface Temperature of Land Use Types

Surface Temperature

35 °C — 33.38 33.14 33.10 30.15 30.08
30 °C
25 °C
20 °C
15 °C
10 °C
5 °C
0 °C

Bitumen Industrial Residential Irrigated Grass Trees

MILESTONE 2
ASSESS THE CLIMATE VULNERABILITY OF CURRENT URBAN TREES

Assessing the climate vulnerability of current urban trees

Identification

- Undertook an audit of trees within identified heat islands

Methodology

- Utilised a similar methodology as set out in the Australian National University and ACT Government 'Urban Forest Tree Species Research for the ACT.
- This methodology uses regional climate data and species-level traits to develop a multi-criteria selection matrix to assess a tree species likely ability to survive a changing climate.

Multicriteria Selection Matrix

Drought tolerance	Frost tolerance	Extreme heat tolerance	Shade type
Weed potential	Useful life expectancy	Irrigation requirement	Available soil volume

Each tree species was assessed against the matrix and placed into one of three 'traffic light' categorises

Cootamundra Wattle	Acacia baileyana
Coast myall	Acacia binervia
Blue Bush	Acacia covenyi
Green Wattle	Acacia decurrens
Gossamer wattle	Acacia floribunda
Ovens wattle	Acacia pravissima
Feijoa	Acca sellowiana
Box Elder	Acer negundo
Japanese maple	Acer palmatum
Canadian Maple	Acer rubrum
European horse-chestnut	Aesculus hippocastan
Persian silk tree	Albizia julibrissin
Irish Strawberry Tree	Arbutus unedo
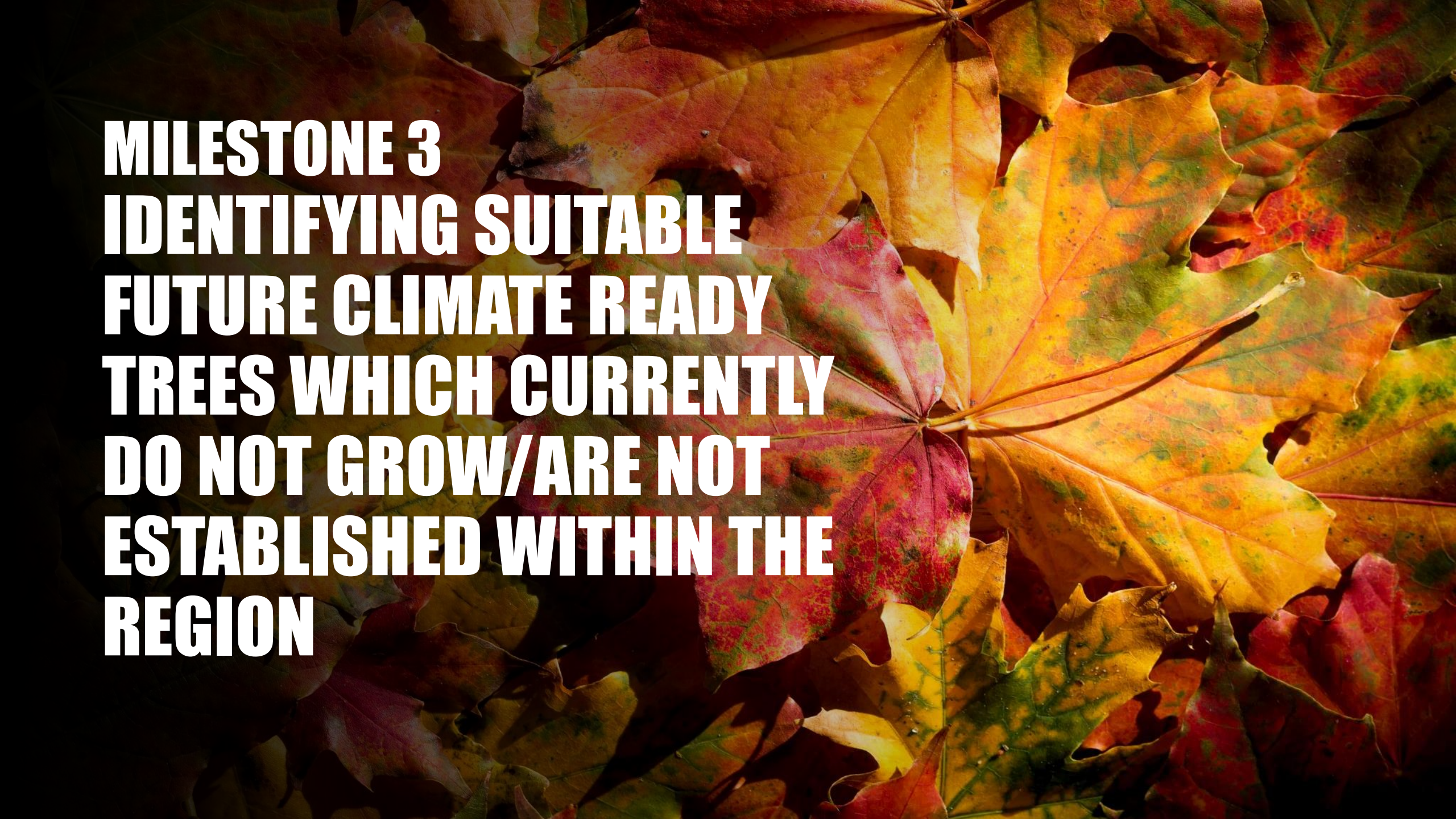
Assessing the climate vulnerability of current urban trees

Identifying which trees to continue to propagate and plant in urban environments

Green: Tree species which are likely to perform well under future climate change and are recommended for continued planting within urban areas throughout the LGA.

Orange: Tree species which are likely to perform Ok under future climate change and in certain circumstances are recommend for continued planting within urban areas throughout the LGA.

Red: Tree species which are unlikely to perform well under future climate change and are not recommend for continued planting within urban areas throughout the LGA.

MILESTONE 3
IDENTIFYING SUITABLE FUTURE CLIMATE READY TREES WHICH CURRENTLY DO NOT GROW/ARE NOT ESTABLISHED WITHIN THE REGION

Identifying suitable future climate ready trees which currently do not grow/are not established within the region

Already analyzed over 1300 trees species and their realised climatic niches across their known distribution.

Calculating the mean, median, and 5th/95th percentiles of 3 key climate variables:

- Maximum temperature of the warmest month
- Precipitation of the warmest quarter
- Potential evapotranspiration

Assessing the vulnerability of Australia's urban forests to climate extremes

Manuel Esperon-Rodriguez[1] | Sally A. Power[1] | Mark G. Tjoelker[1] | Linda J. Beaumont[2] | Hugh Burley[2] | Dayenari Caballero-Rodriguez[3] | Paul D. [

Application to QPRC

- Utilised regional climate data to project Queanbeyan-Palerangs likely climate in 2030 & 2070 with regards to maximum average temperature during the warmest month, and precipitation during the warmest quarter. Frost resilience was also another significant consideration

- Analysed all 1300 tree species for their suitability under the projected future climate of Queanbeyan-Palerang (2030 & 2070)

- 150 trees species (which are currently now established in the region) have now been identified as **potentially** suitable for propagation and planting within the region.

NSW Climate projections map for 2020-2039

Temperature: Change in average temperature (°C)

Region view   Grid view   Zoom to   NSW suburb or postcode

MILESTONE 4
EXPERIMENTAL PILOT
PLANTINGS OF
POTENTIALLY SUITABLE
FUTURE CLIMATE READY
TREES

Experimental Pilot Plantings- Bungendore Sports Ground

Eucalyptus macrandra- Western Australia

Geijera parviflora- Far west NSW & Queensland

Parrotia persica- Iran

Corymbia citriodora- Queensland

Agonis flexuosa- Western Australia (south-west)

Eucalyptus erythrocorys- Western Australia

Ficus macrophylla- Coastal NSW and Queensland

MILESTONE 5
URBAN FOREST
COOLING
STRATEGY

QPR

Urban Forest Cooling Strategy

Vision

Council, businesses and the community value and actively care for an urban forest that is resilient, distributed, and provides a cooler, healthier environment for people and wildlife

Key Goals

- Resilient urban forest
- A fairly-distributed urban forest
- A cooler, greener urban environment
- Increased biodiversity and tree canopy
- An actively managed urban forest

Strategies

1. Build awareness and encourage participation in urban greening
2. Expand data collection and monitoring of the urban forest
3. Coordinate tree and vegetation planting and management
4. Review planning policy and development controls
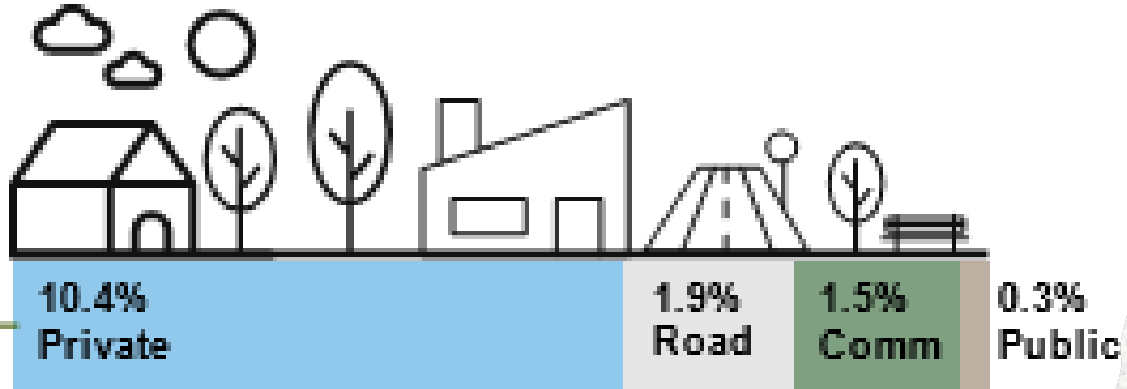5. Increase Council capacity in urban forest management

QUEANBEYAN-PALERANG REGIONAL CO

Urban Forest Cooling Stra
November 2

TIMEFRAME 5 YEARS

Urban Forest Cooling Strategy

ACTIONS

- Establish an Urban Greening Volunteer Program to coordinate community and Council efforts for tree planting and support more impactful initiatives.

- Undertake an audit of overall tree canopy loss and gains every two years

- Set urban forest targets to guide future planning and evaluation such as tree canopy cover, biodiversity, number of trees planted and tree health. Incorporate these targets into relevant planning documents and policies

- Review and refine planning instruments to support multifunctionality of blue, grey and green infrastructure, particularly WSUD integration opportunities.

- Development of a significant tree register

- Include urban forest impacts as an item in Council reporting/decision-making templates and tool

Photo competition

Q&A

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IRCC resources

- Written case studies
  - Case studies covering planning and engagement, adapting to heat and drought, and adapting to floods and storms
  - Links to resources for councils produced through the IRCC program

- Project videos and podcasts
  - Featuring a range of the 31 local government IRCC projects

https://lgnsw.org.au/IRCCprogram

Stay in touch

Subscribe to the AdaptNSW newsletter to hear about future news and events and other climate change adaptation information:

https://climatechange.environment.nsw.gov.au/Adapting-to-climate-change/AdaptNSW-Newsletter

Thank you

Contact us:
Adapt.nsw@environment.nsw.gov.au

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