NSW GOVERNMENT

Webinar 4 – Climate change, health and our communities

Adaptation in Action: Building Resilience in NSW

Thursday 26 November 2020 | 2pm – 3:30pm

AdaptNSW Webinar Series

Welcome

Matthew Riley
Director of Climate and Atmospheric Science Branch
Science, Economics and Insights Division
NSW Department of Planning, Industry and Environment

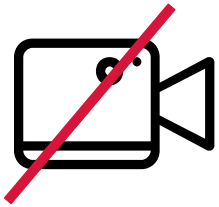
Acknowledgement of Country

Matthew Riley

Director of Climate and Atmospheric Science Branch
Science, Economics and Insights Division
NSW Department of Planning, Industry and Environment

'Water dreaming' by Selina Numina

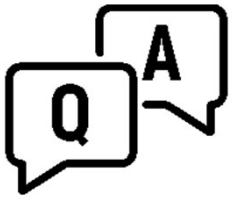
Meeting rules and interaction



Turn off your camera

Mute yourself

Use the chat box



Dedicated Q&A time after the event

Closed captions are available

Presentation will be available

Today's webinar will be recorded

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Minister’s Address

AdaptNSW Webinar Series

The Hon. Matt Kean
NSW Minister for Energy and Environment

Video

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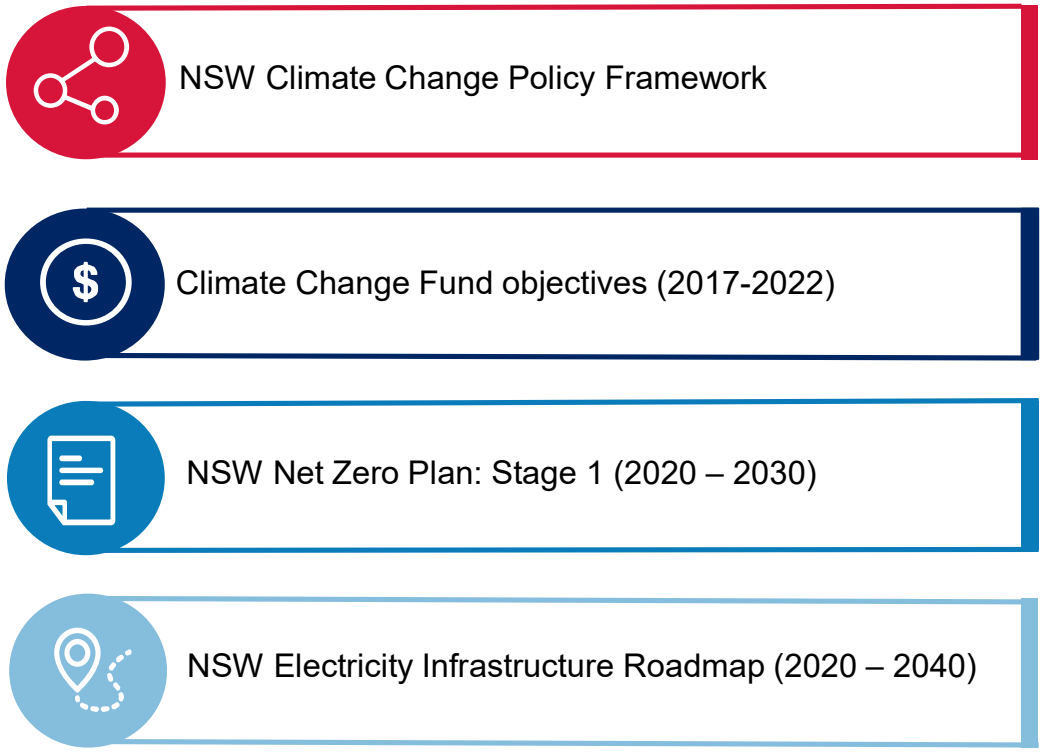
Overview of NSW Government Action

AdaptNSW Webinar Series

Matthew Riley
Director of Climate and Atmospheric Science Branch
Science, Economics and Insights Division
NSW Department of Planning, Industry and Environment

NSW Climate Change Policy framework

NSW Government is leading initiatives to make NSW more resilient to climate change and to support the state to achieve net zero emissions by 2050.



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NSW Climate Change Policy Framework

Long-term objectives

Achieve net-zero emissions by 2050
NSW is more resilient to a changing climate

NSW Government Policy Directions

Take advantage of opportunities to grow new industries in NSW	Reduce risks and damage to public and private assets in NSW arising from climate change	Reduce climate change impacts on health and wellbeing	Manage impacts on natural resources, ecosystems and communities

Implementation

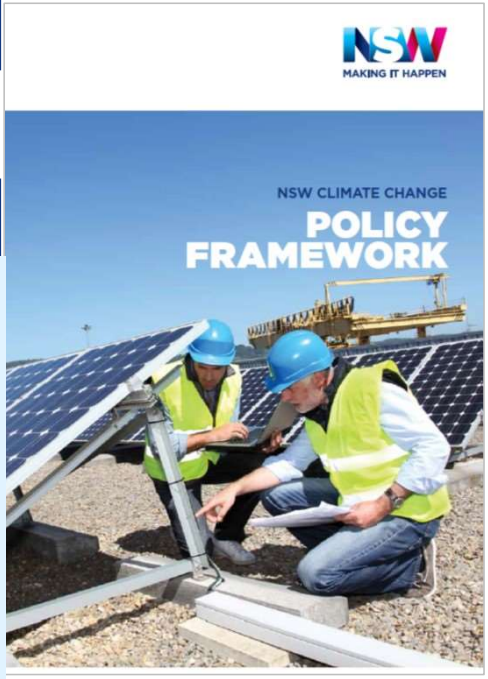
Investigate how to embed climate change emissions savings and adaptation in government decision making

Roles of NSW Government

Government policy:
Implement policies to plan for climate risks and provide targeted support for households, communities and businesses that is fair, efficient and in the public interest

Government operations:
Assess and effectively manage climate change risk to government assets and services

Government advocacy:
Advocate for Commonwealth, COAG and international action to support effective adaptation



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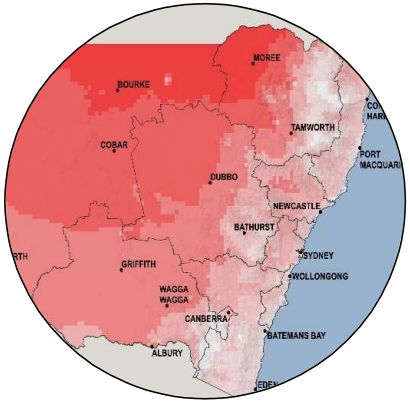
Climate and Atmospheric Science Branch

Climate Science Expertise/Advisory Role



Regional climate modelling

Natural hazards & climate extremes

Risks to Critical Infrastructure

Human Health & Social Impacts

Urban heat & green cover

Energy Efficiency Decision Making

Climate Impacts Research

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Drivers of NSW climate research and policy

Delivering research to support NSW business, government and the community to prepare and adapt to the impacts of climate change

- 1.1°C increase in average NSW temperature since 1950's
  2.1°C **additional** increase in NSW temperatures by the 2070's
- Multiple climate driven risks, including bushfires, heatwaves, flooding, East Coast Lows with major consequences and extreme risk rating
- NSW DPIE are stewards of NSW biodiversity and manages 10% of NSW lands and 50% of NSW coastlines
- 1.2M extra people living in Sydney by 2031, most in Western Sydney i.e. 85,000 more people each year

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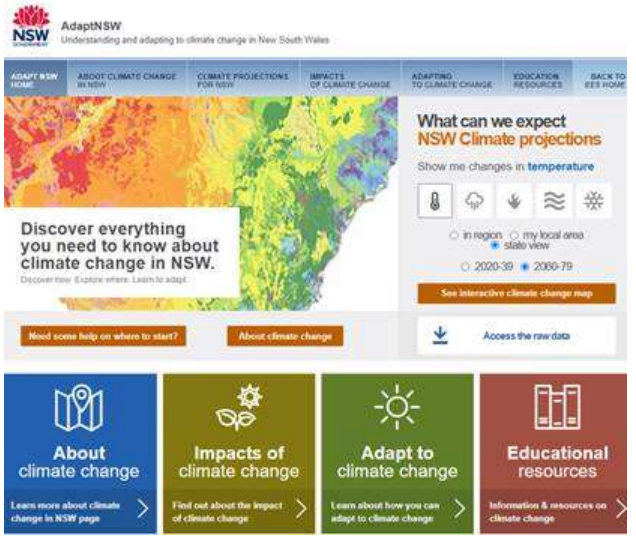
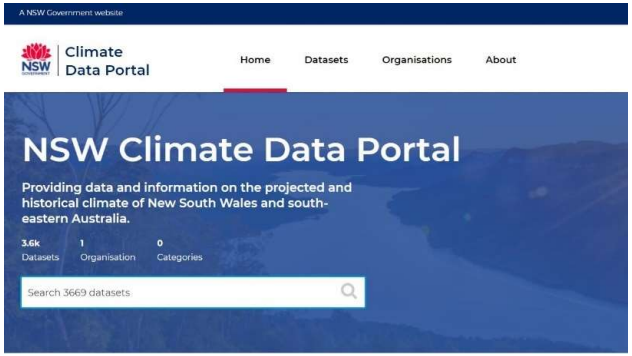
NSW Government Climate Tools

Helping NSW governments, communities, businesses and organisations understand how climate change may affect them and what they can do to respond and adapt to the impacts.

- Providing access to independent and rigorously produced climate change information through the AdaptNSW website
- NSW Climate Data Portal
- NSW and ACT Regional Climate Modelling (NARCliM) Project
- Regional climate snapshots and interactive map





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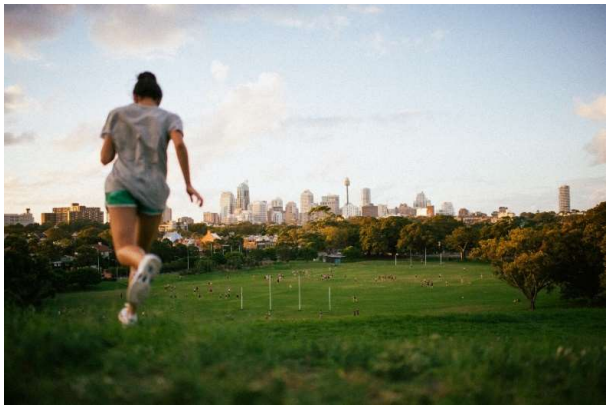
Human Health and Social Impacts Node

Collaboration between the Department and University of Sydney to further develop understanding of the impact of climate change on human health and social wellbeing.

The Node is:

- delivering robust, sector specific information targeting the health system, vulnerable communities and government agencies
- establishing baselines for monitoring, evaluation and analysis of adaptation programs that seek to protect and promote health, and strengthen the delivery of health services, in the face of a changing climate
- improving understanding of vulnerability in the context of exposure, sensitivity and adaptive capacity
- providing practical information on building resilience in communities and in the health sector.



Node Partners:

THE UNIVERSITY OF SYDNEY

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The mental health impacts of climate change, and building resilience in rural communities

Presentation 1

Dr Jo Longman
Research Fellow, University Centre for Rural Health
and Sydney University Environment Institute
University of Sydney

Identifying the Mental Health Impacts of Climate Change and Enhancing Resilience in Rural Communities

Dr Jo Longman, Maddy Braddon, Dr Blanche Verlie, Prof David Schlosberg

University Centre for Rural Health and Sydney Environment Institute, University of Sydney

Sarah Rogers/Daily Beast/Photos Getty

Shed of Hope INC Drake NSW bushfire recovery initiative (2019)

THE UNIVERSITY OF SYDNEY – School of Rural Health

BROKEN HILL University Department of Rural Health

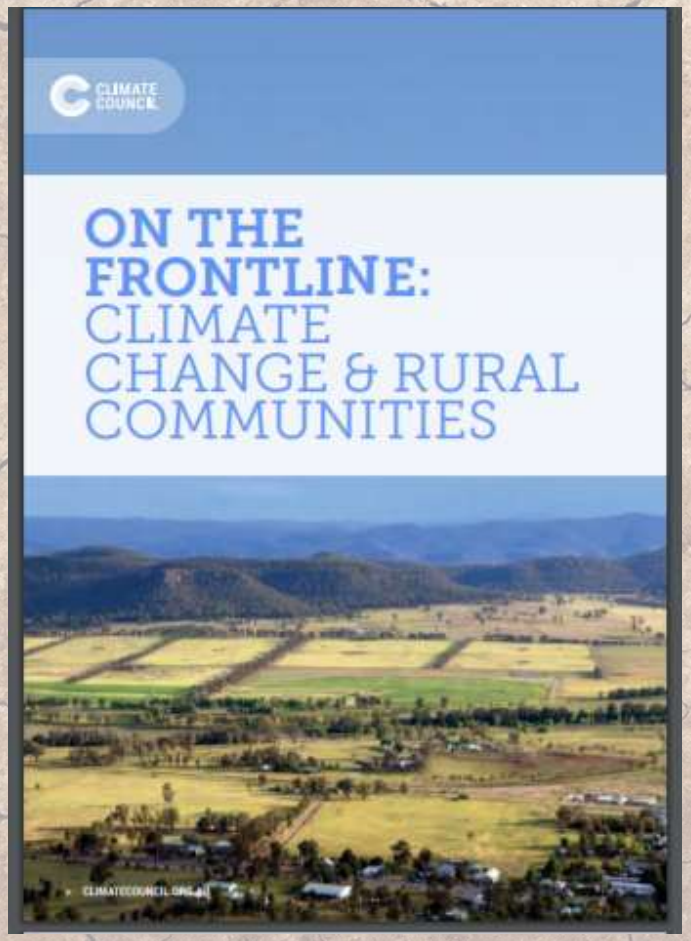
University Centre for RURAL HEALTH education • research • workforce

NSW GOVERNMENT Planning, Industry & Environment

This presentation will:

- Background to this study
- Aims of study
- Methods
- Results:
  - Mental health impacts of climate change
  - Typology
  - Resilience

Background



"The risks posed by climate change to health [including mental health], security, environmental assets and economy threaten to exacerbate many of the social, economic and health inequalities already experienced by those in rural areas."
Climate Council 2016[1]

Background

- Previous study following catastrophic flooding in Northern NSW 2017 - association between flood and negative mental health outcomes (greater impact on disadvantaged populations)
- Individual and community resilience associated, in general, with less risk of negative mental health outcomes
- Impacts of climate change on mental health broader than this

Artist *Theresa Mason*

Study aim/objectives

- Identify the range of mental health impacts of climate change, particularly from rural Australian studies
- Develop a typology of those impacts
- Understand how resilience to the mental health impacts of climate change might be enhanced in rural communities

Typology – what is it and why do we need it?

Defined as:

- A classification (of mental health impacts) according to general categories

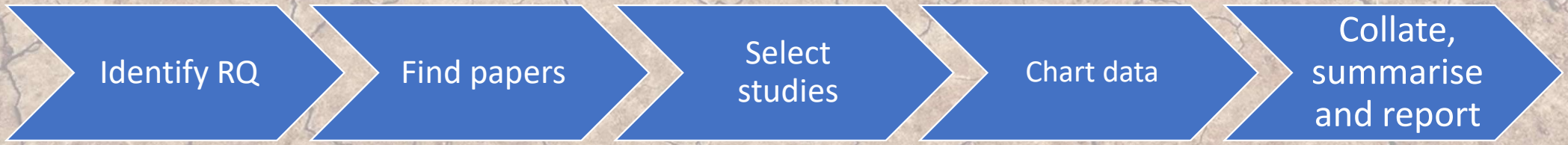
Need it because:

- Without it our capacity to develop policies and pathways for increasing adaptability and resilience is compromised

Methods

Scoping study (following Pham et al 2014[2]):

5 steps:



Mental health impacts of climate change

Mood disorders
- Post-traumatic stress
- Depression
- Anxiety

Suicidality

Exacerbation of pre-existing acute mental illness

Distress
- Concern for pets/livestock
- Stress
- Fear
- Anger
- Sadness
- Guilt
- Helplessness
- Hopelessness
- Frustration

Distress for potential and actual losses of others

Generalised climate anxiety/eco-anxiety

Loss of identity, knowledge and confidence, belonging, place

At community level
- Corrosion of social foundation
- Challenge to ways of life
- Decreased community wellbeing

Post-traumatic growth
Compassion

5 Zoom workshops in rural NSW

MH outcomes	DIRECT impacts - Mental health directly impacted from severe weather-related events	DISTAL impacts – less direct mental health impact e.g. feeling distressed by the bushfires without having to be in a bushfire oneself	Generalised climate anxiety - Mental health impacts from wider concern about the health of the planet/the future[5, 6]
Exacerbation of pre-existing acute mental illness e.g. schizophrenia[7, 8]	✓		
Mood disorders[2]	✓	✓	✓
• Post-traumatic stress[5, 12-15]	✓		
• Depression[5, 6]	✓		✓
• Anxiety[5, 6, 16]	✓	✓	✓
Increase in suicidality[17]	✓		
Emotional distress[2, 18]	✓	✓	
• Still distressed[13]	✓	✓	✓
• Concern/distress around livestock/pets[19]	✓		
• Burnout [20]	✓		✓
• Stress/psychological distress[21-23]	✓	✓	✓
• Fear[19, 24]	✓	✓	✓

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• Stress/psychological distress[21-23]	✓	✓	✓
• Fear[19, 24]	✓	✓	✓

Summary

- Mental health impacts of climate change many and varied, positive and negative, immediate and longer-term
- Don’t have to be directly impacted to be affected
- This underscores the importance of a focus on mental health in any efforts to address climate change impacts
- There seem to be 3 pathways:
  - Direct
  - Distal
  - Generalised climate anxiety
- Some populations more vulnerable to these mental health impacts

Link between mental health and resilience

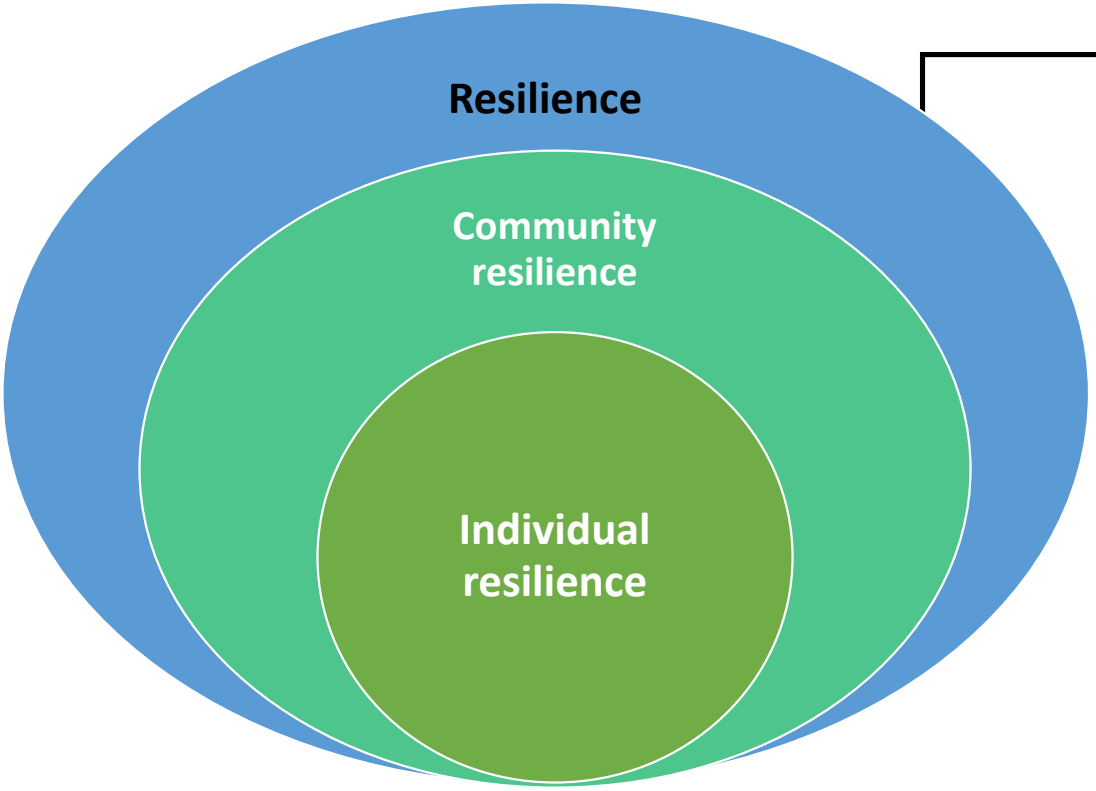
Many and varied mental health impacts of climate change

Individual and community resilience

↑ associated with ↑

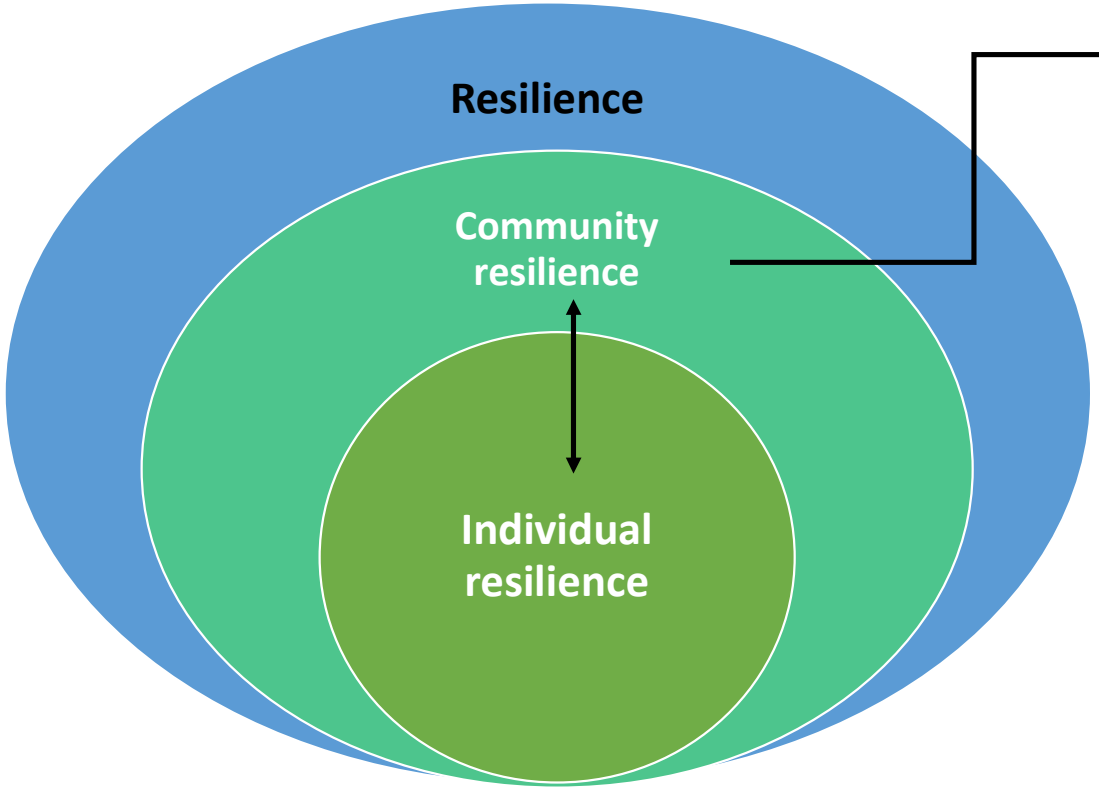
Positive mental health[3-7]

Resilience



"the capacity of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation"
– IPCC (2014)

Resilience



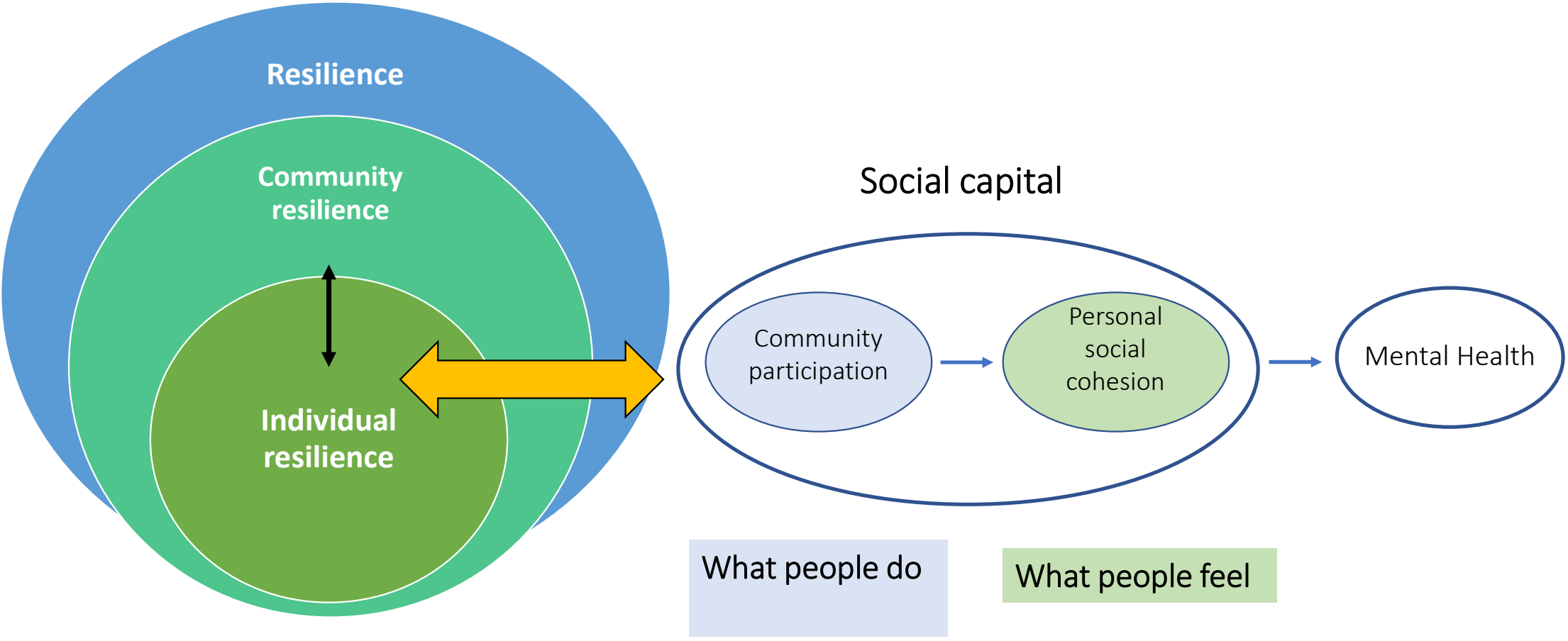
"the existence, development, and engagement of community resources by community members to thrive in an environment characterised by change, uncertainty, unpredictability, and surprise" - Magis (2010)[8]

Is associated with:

- Optimism
- Being socially connected
- Learning from the past

Madsen & O'Mullan (2016)[9]

Social capital



Berry & Welsh (2010)[10], Berry & Shipley (2009)[11]

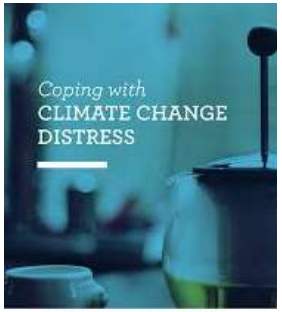
What do we know about activities/events/projects/strategies aiming to increase resilience to the mental health impacts of climate change in rural Australia?

(e.g. public events that restore or create new social connections)

Events

(e.g. Landcare)

Group activities



(e.g. Psychology for a Safe Climate. Coping with climate change distress guide.

Self help and support materials

Peer support (including the opportunity to offer it)

HOTSPOTS FIRE PROJECT

Emergency services, organizational activities/support

(e.g. RFS & Nature Conservation Council NSW supporting HOTSPOTS (community engagement program developing fire management skills)

MENTAL HEALTH FIRST AID Australia

Measures that address the psychosocial impacts of climate change

Priorities:

Community-led – working together (finding common ground)

“Action as an antidote to despair”

Being heard – channels for expression

Sustainable local support

Summary

- Association between resilience and positive mental health outcomes
- Gaps in our knowledge and understanding:
  - What is happening in local rural contexts?
  - What is effective, for whom, where, under what circumstances and why?

References

1. Climate Council. On the frontline: climate change and rural communities. Available at https://www.climatecouncil.org.au/uploads/564abfd96ebac5cbc6cf45de2f17e12d.pdf
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3. Hart CR, Berry HL, Tonna AM. Improving the mental health of rural New South Wales communities facing drought and other adversities. Australian Journal of Rural Health. 2011;19(5):231-8.
4. Cheng JJ, Berry P. Health co-benefits and risks of public health adaptation strategies to climate change: a review of current literature. Int J Public Health. 2013;58(2):305-11.
5. Hayes K, Berry P, Ebi KL. Factors Influencing the Mental Health Consequences of Climate Change in Canada. International journal of environmental research and public health. 2019;16(9):1583.
6. Greene G, Paranjothy S, Palmer SR. Resilience and vulnerability to the psychological harm from flooding: The role of social cohesion. American journal of public health. 2015;105(9):1792-5.
7. Benevolenza MA, DeRigne L. The impact of climate change and natural disasters on vulnerable populations: A systematic review of literature. Journal of Human Behavior in the Social Environment. 2019;29(2):266-81.
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10. Berry HL, Welsh JA. Social capital and health in Australia: an overview from the household, income and labour dynamics in Australia survey. Social science & medicine. 2010;70(4):588-96.
11. Berry HL, Shipley M. Longing to belong: personal social capital and psychological distress in an Australian coastal region: Department of Families, Housing, Community Services and Indigenous Affairs; 2009.

Thank you

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University Department of Rural Health

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Environmental and social indicators for health impact assessment of climate risks and human adaptations

Presentation 2

Dr Ivan Hannigan
Environmental Epidemiologist
The University of Sydney and Centre for Air pollution, energy and health Research (CAR)

Human Health and Social Impacts Node

Environmental Health Indicators for Heatwaves, Climate change, Urban heat island and Greenspace

Ivan Hanigan PhD

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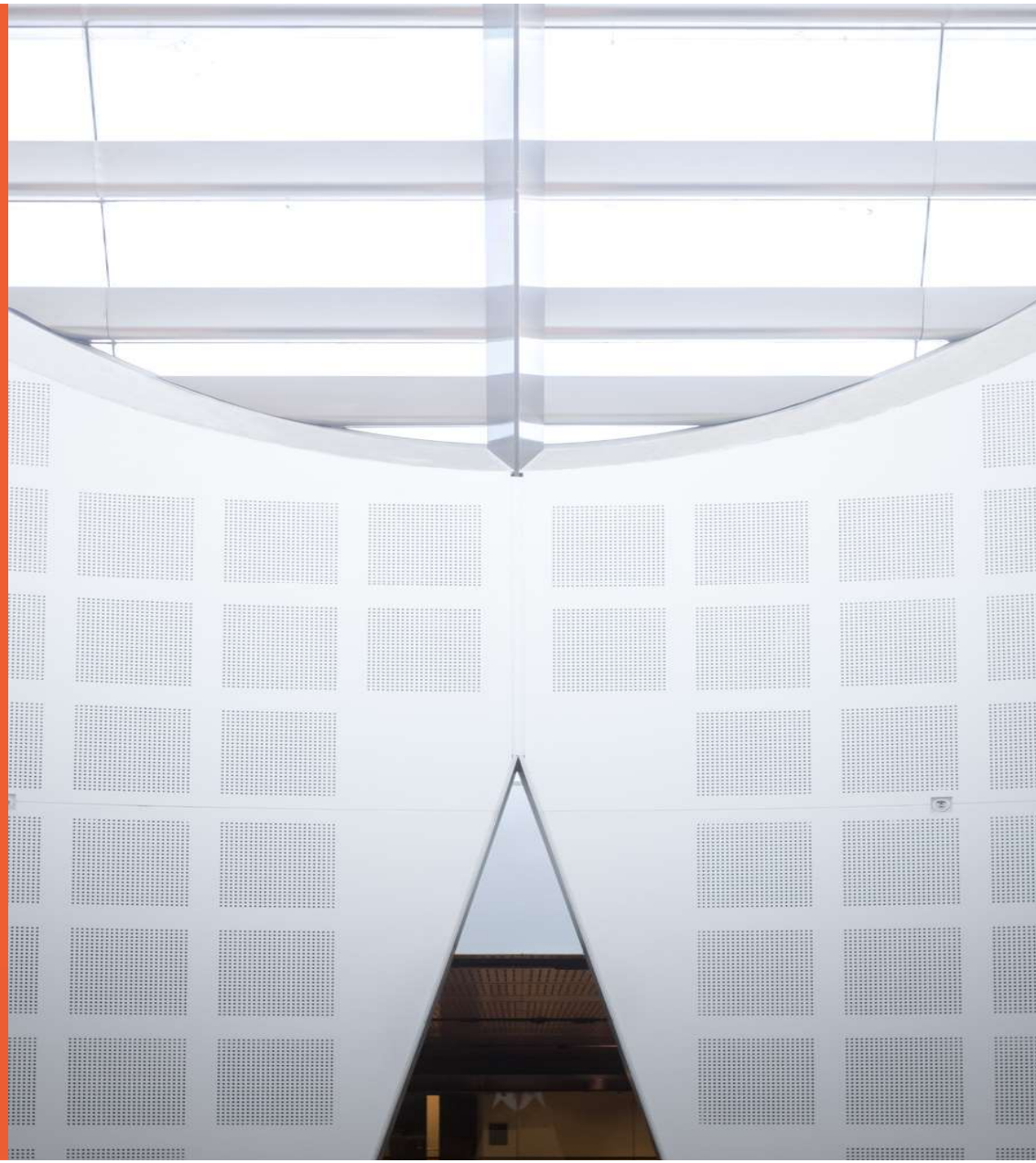


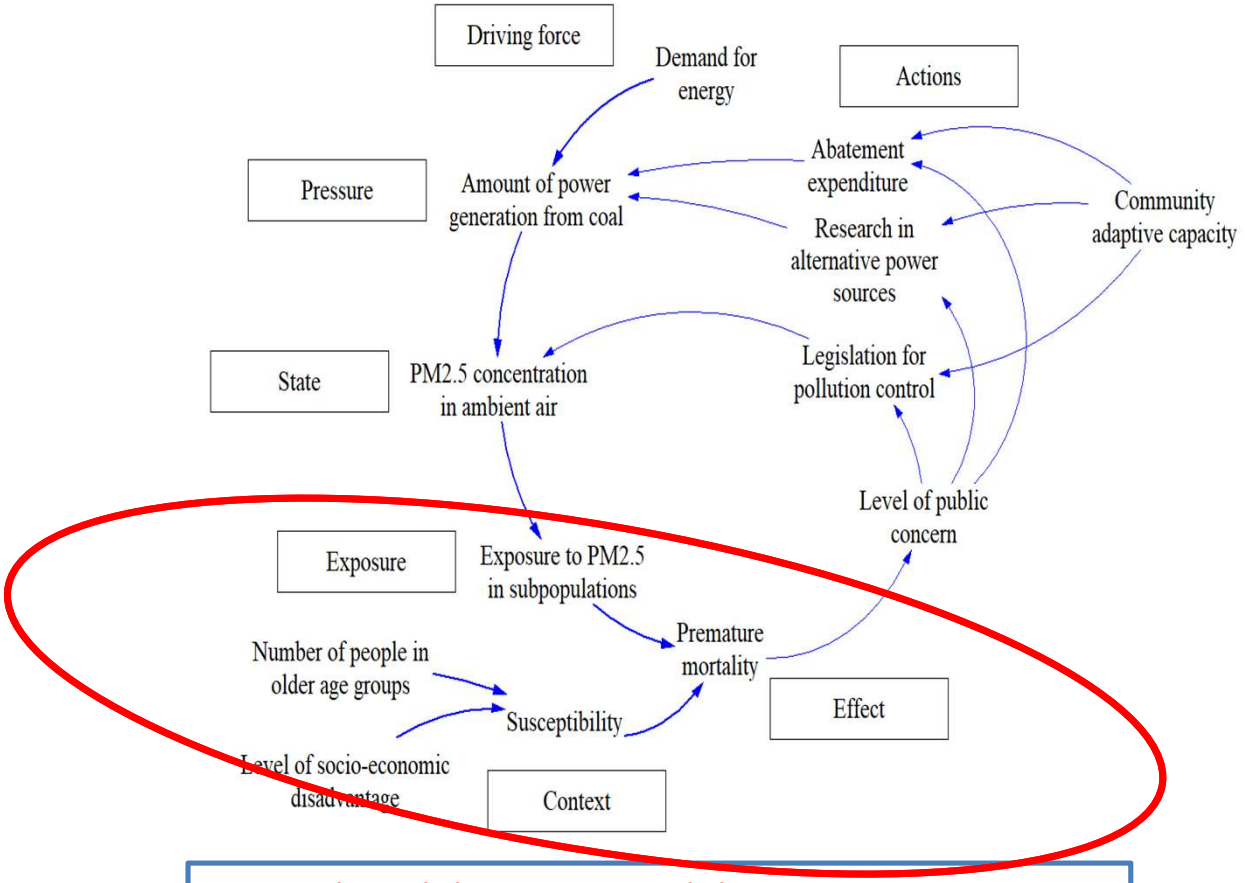
Background

2019 project for HHSI: EHI for 10 selected environmental risks

DPSEEA:

Corvalan, Briggs, Kjellstrom (WHO1996)
UK: Morris et al. 2006, Reis et al. 2015
Aus: Boylan et al. 2018 (a HHSI project), Edokpolo et al. 2019 (EPA Vic)

Example: Air pollution (PM2.5) and mortality

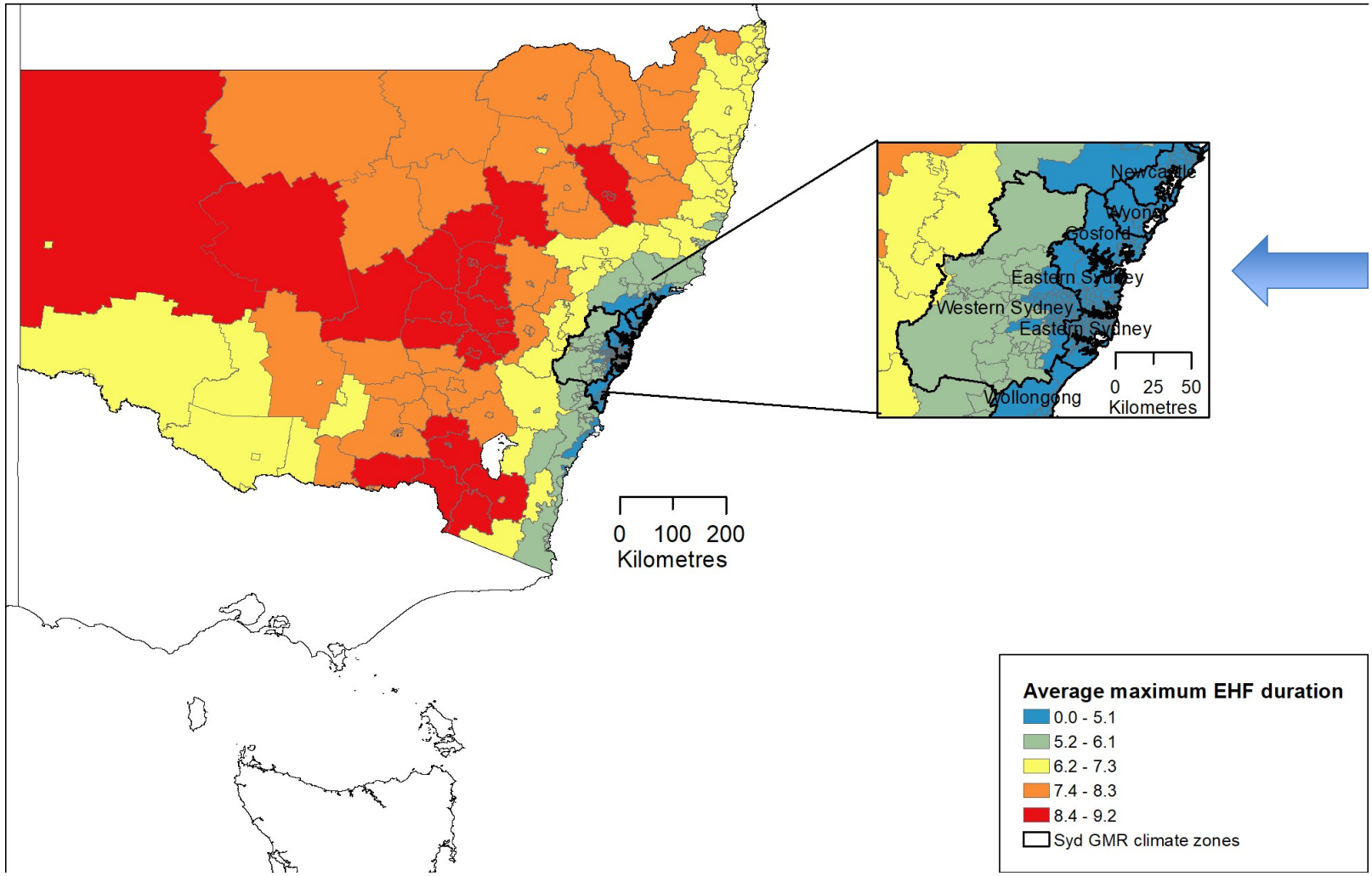


Vulnerability = susceptibility X exposure X adaptive capacity

Summary of indicators in previous

	Health impact function Literature base	**Driving forces**	**Pressures**	**State**	**Exposures**	**Effects**	**Actions**
Risk-outcome pair	Qualitative judgement	#indicators	#indicators	#indicators	#indicators	#indicators	#indicators
Air pollution and mortality	Very strong	2	1	2	4	3	1
Mosquito borne disease and RRV	Strong	0	0	1	2	6	0
Noise pollution and IHD deaths	Strong	0	0	2	2	3	0
Urban form and IHD deaths	Strong	0	0	5	4	5	0
Extreme weather events							
- Heatwaves and mortality	Strong	0	0	1	2	2	0
- Drought and suicide	Strong	0	0	1	1	4	1
Aeroallergens and allergic rhinitis	Strong	0	0	1	0	2	0
Water quality and cryptosporidiosis	Strong	0	0	0	0	1	1
Ultraviolet radiation and cancer	Strong	0	0	1	1	1	0
Lead and lead poisoning	Strong	0	0	0	1	1	0
Contaminated sites (PFAS)	Weak	0	0	1	1	0	0

Annual average of maximum heatwave duration averaged by SA2s over all NSW



Sydney GMR climate zones

Methods developed using previous HHSI work and added to this year

- Population and temperature data include the years 1997 and 2018, Mortality data 2006-2018.
- Estimate the T95 (T_{max}) using data from 1997–2016 baseline
- Use seasonal mortality curve from 13 years of NSW-state-level deaths data and small area (SA2) deaths to estimate daily death fractions
- Calculate AN for each day in each climate zone and aggregate to total burden of heatwave deaths per year

Health impact function for heatwaves and mortality

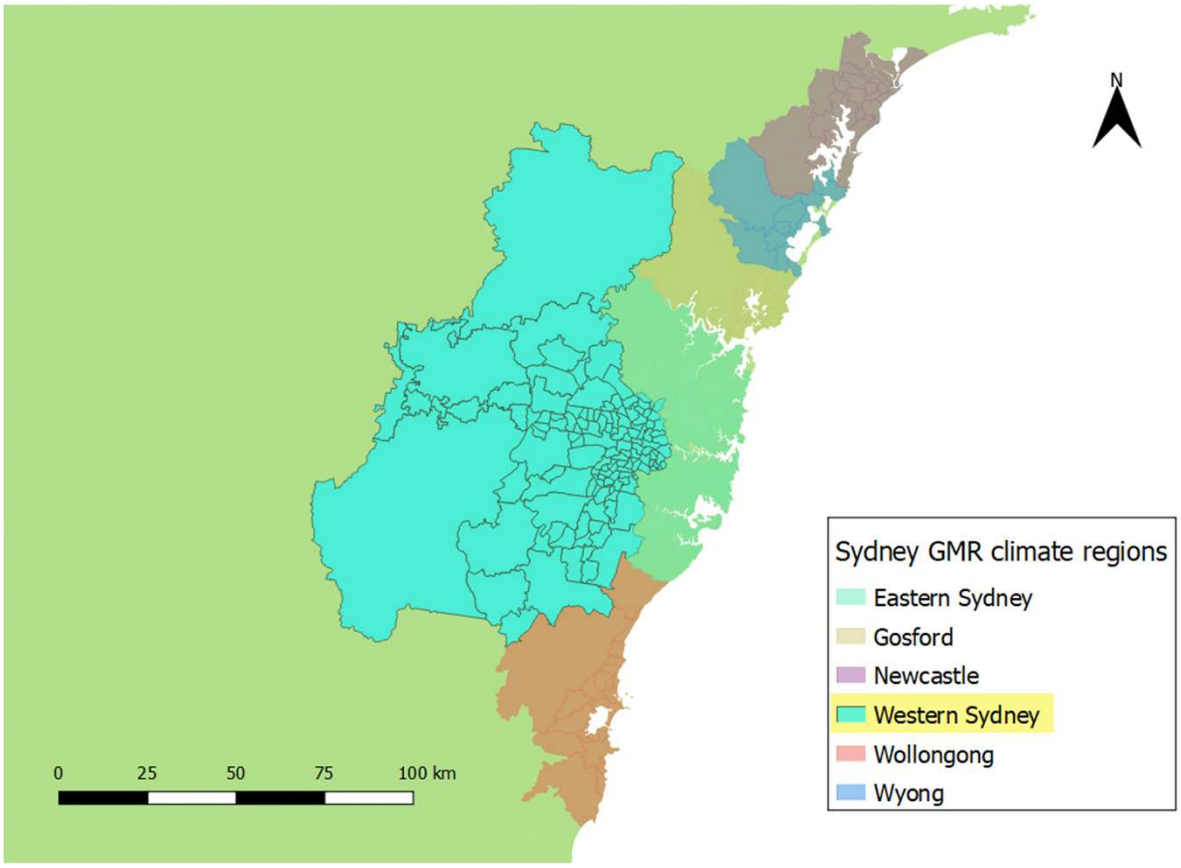
Wang, Guo, FitzGerald et al. (2015) relative risk (RR) estimates were determined in an epidemiological study including Sydney, after distinguishing parameters of best fit (24-h mean temperature vs. Tmax, heatwave durations of 1, 2, 3 and 4 days and age strata) in health models.

We are using the stratified RRs of heat deaths in Sydney

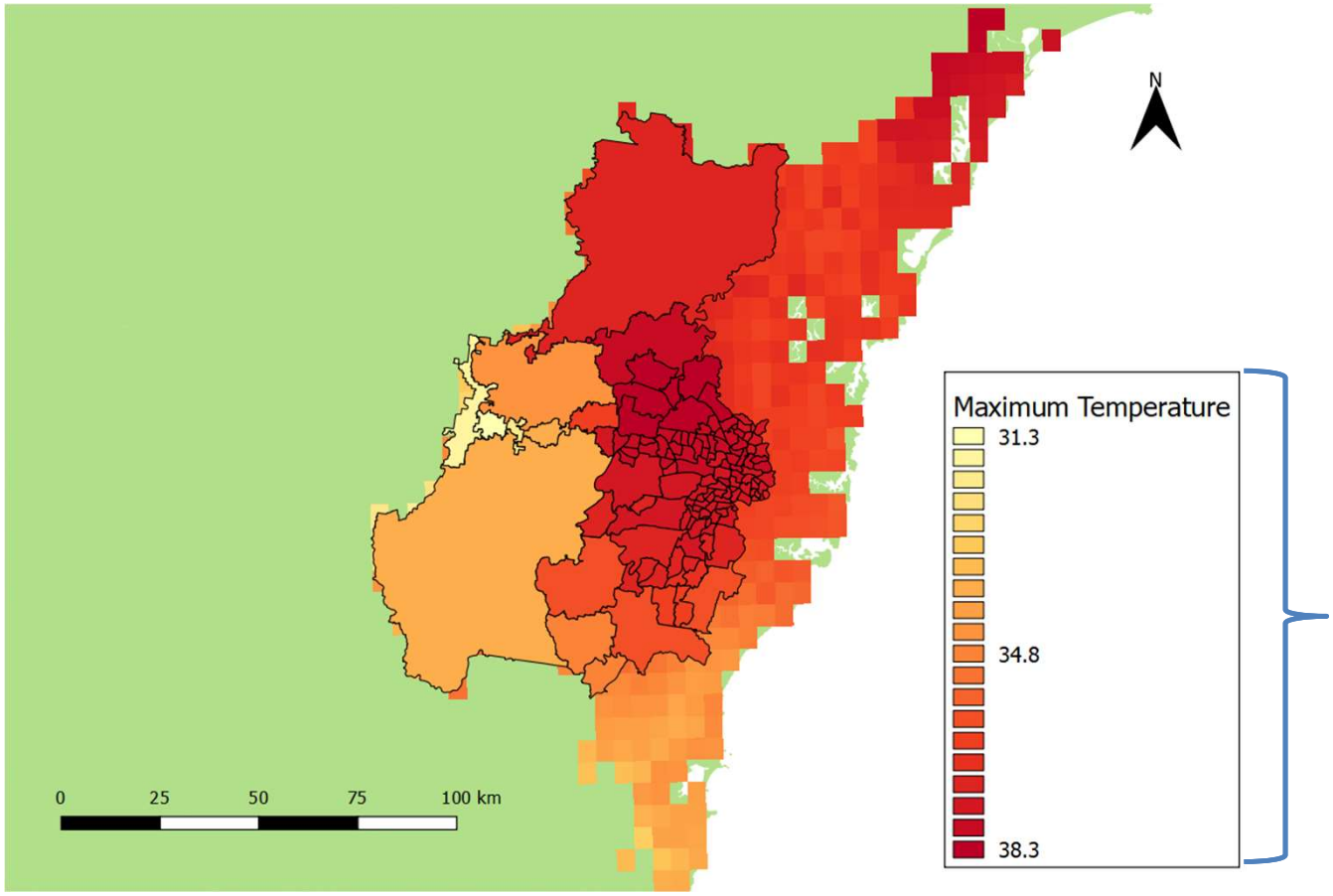
	Under 75 years				Over 75 years			
24-h temperature percentile	90th	95th	98th	99th	90th	95th	98th	99th
RR estimate	1.03	1.02	1.03	1.12	1.03	1.04	1.08	1.12
RR Lower confidence interval	1.01	1.00	0.97	1.02	1.01	1.02	1.03	1.04
RR Upper confidence interval	1.05	1.05	1.08	1.23	1.04	1.07	1.12	1.21

DOI:10.1371/journal.pone.0134233

Sydney GMR climate zones and SA2

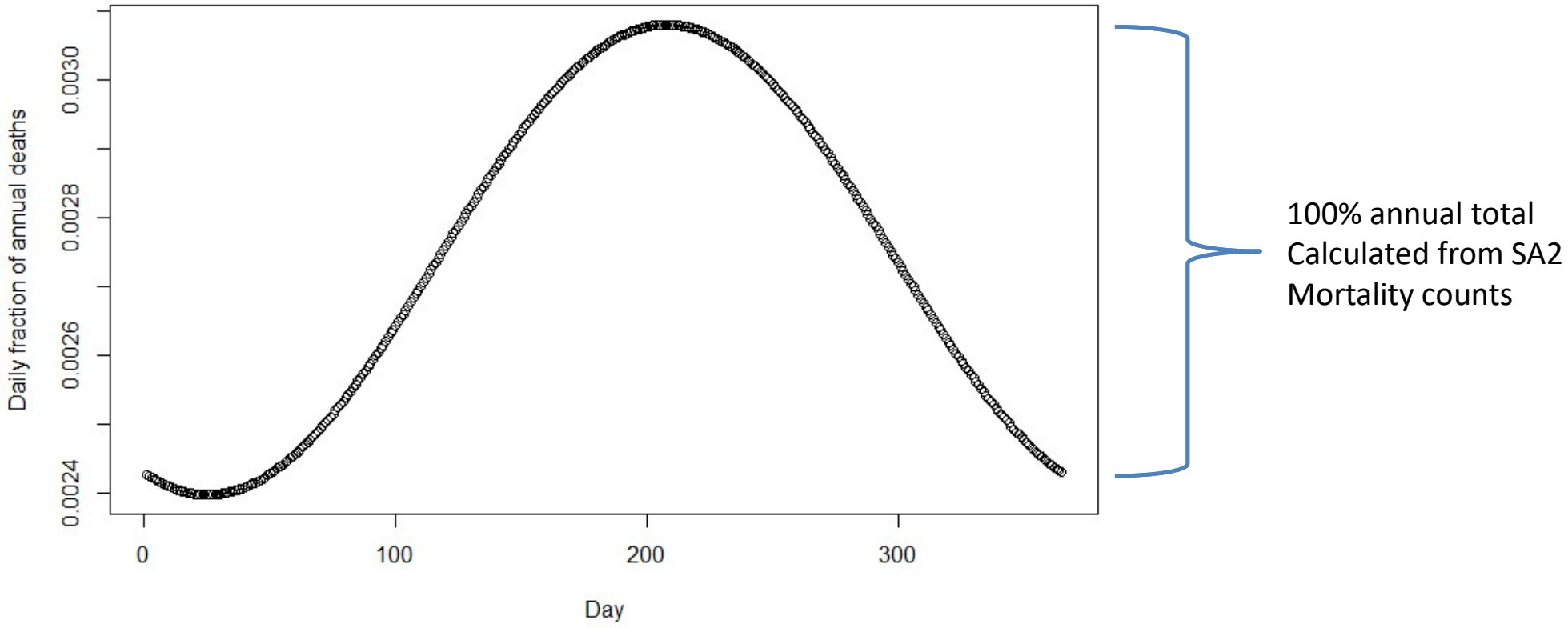


Sydney GMR max temperature in each SA2 on Feb2, 2011



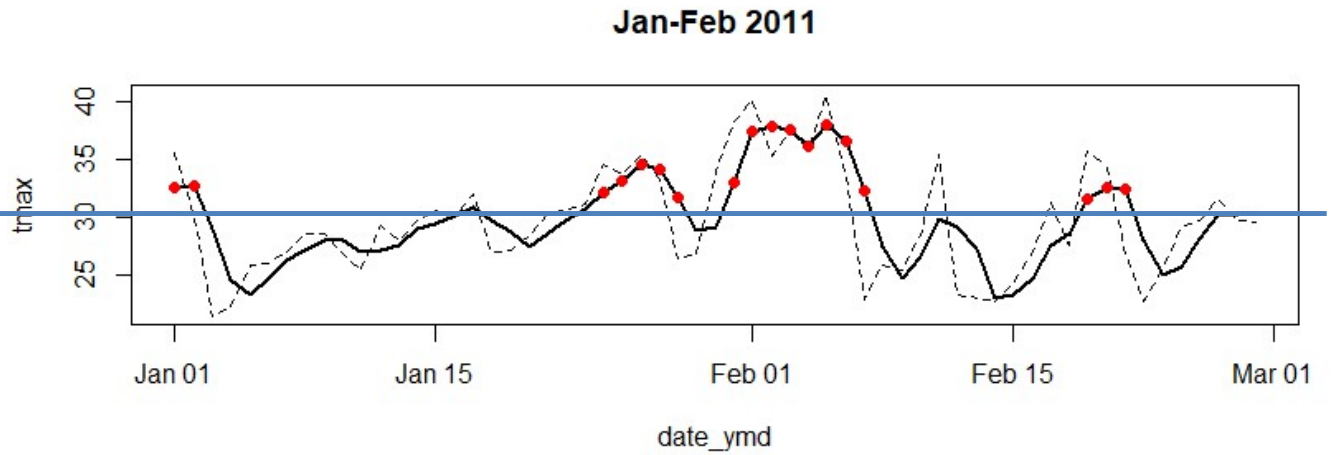
Weighted Average for Climate zone Each day

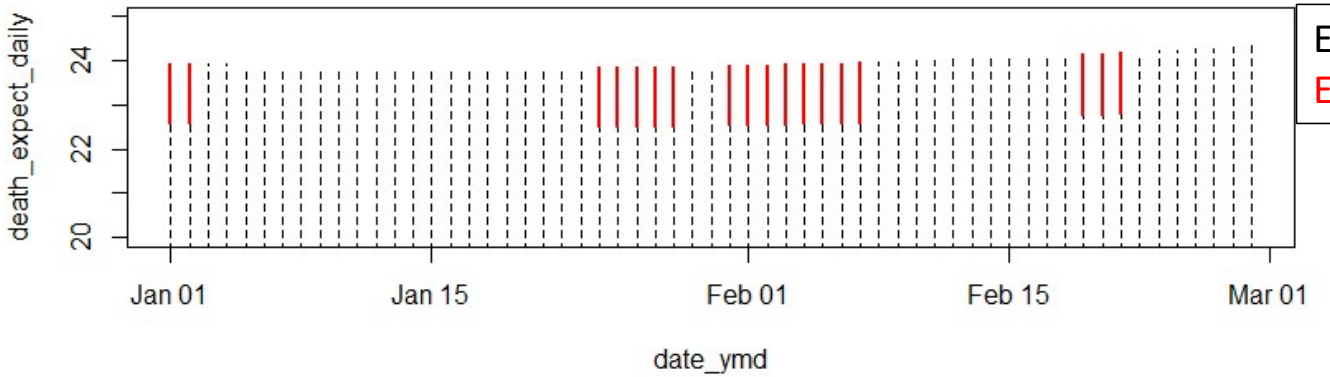
Seasonal adjustment of daily mortality rates for heatwave days



Case study: Western Sydney

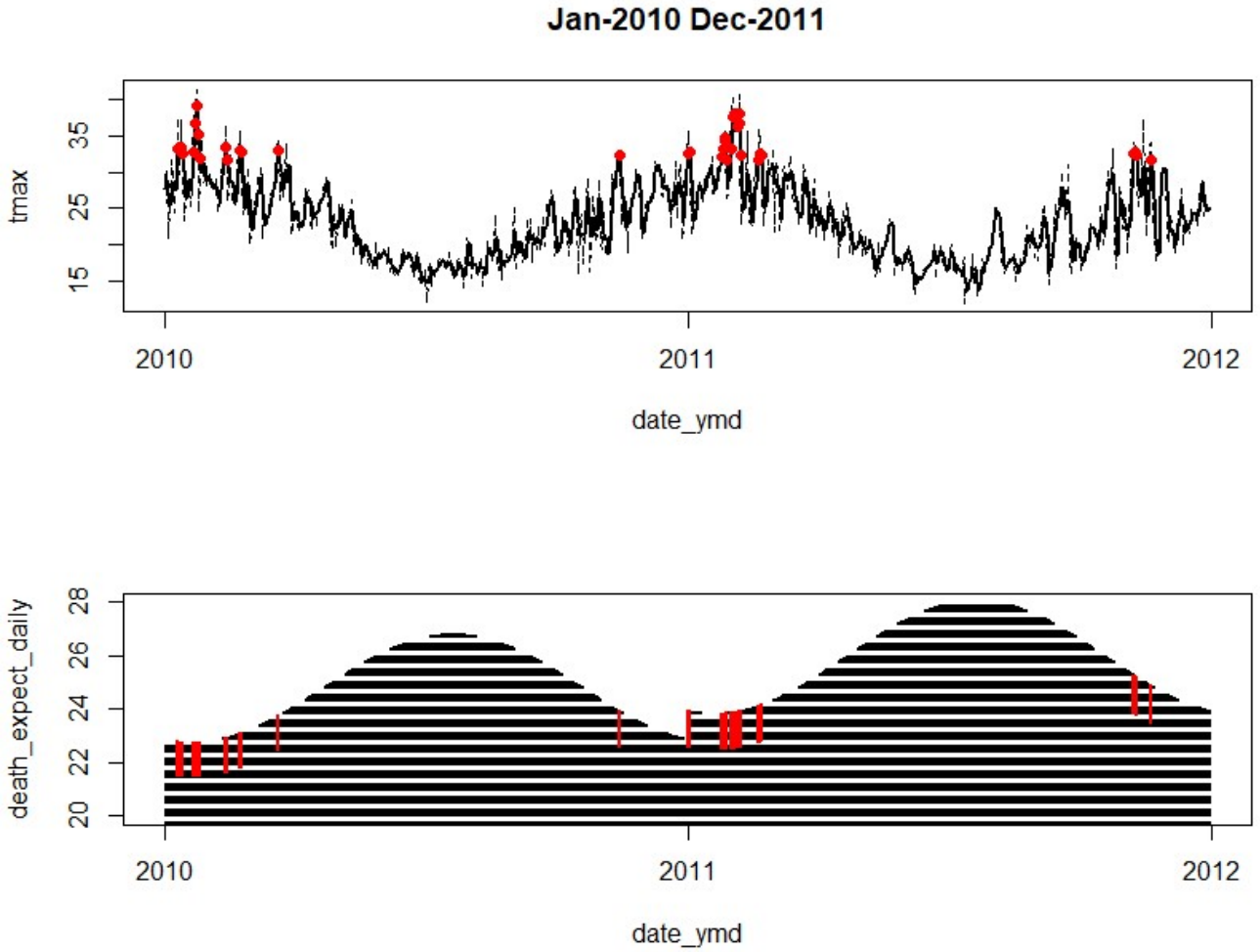
T95 (1997-2016)



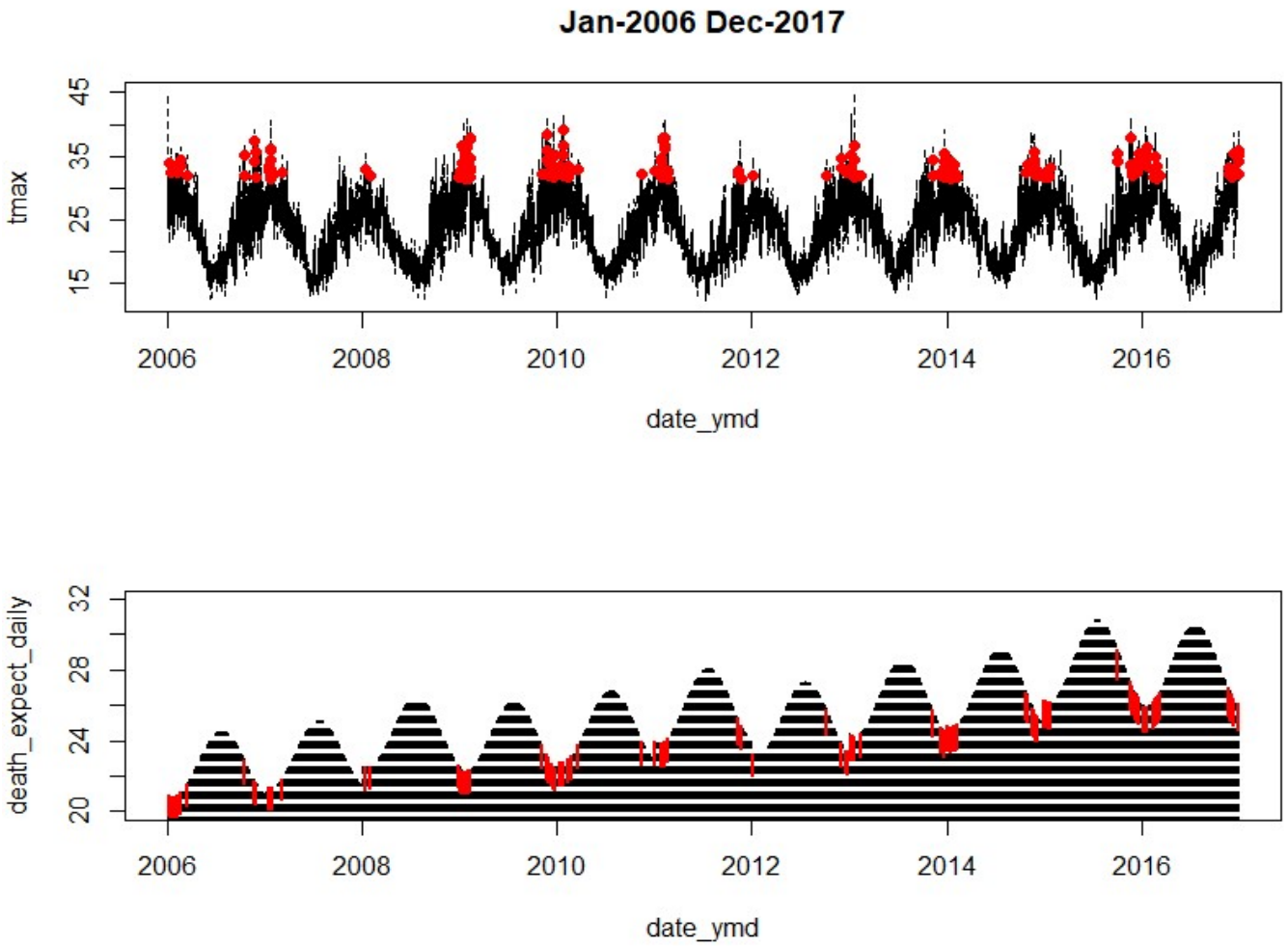


Estimated daily deaths
Estimated heatwave AN

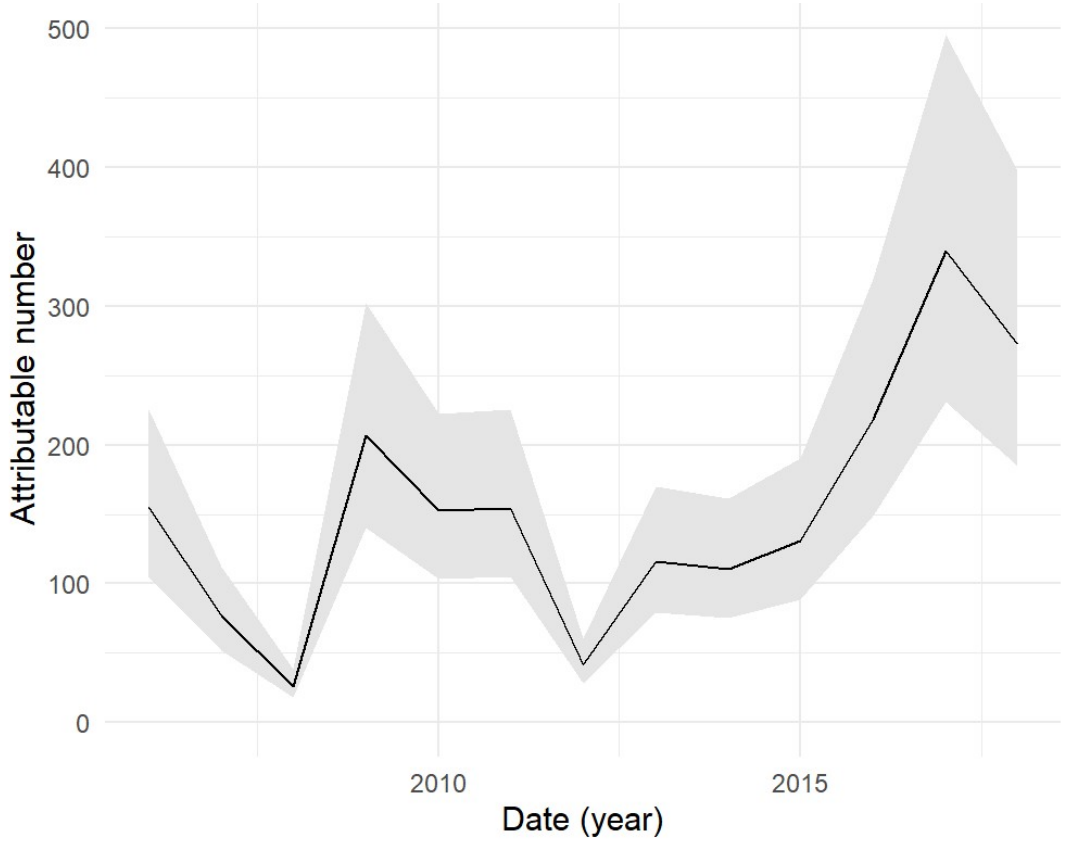
Case study: Western Sydney



Case study: Western Sydney



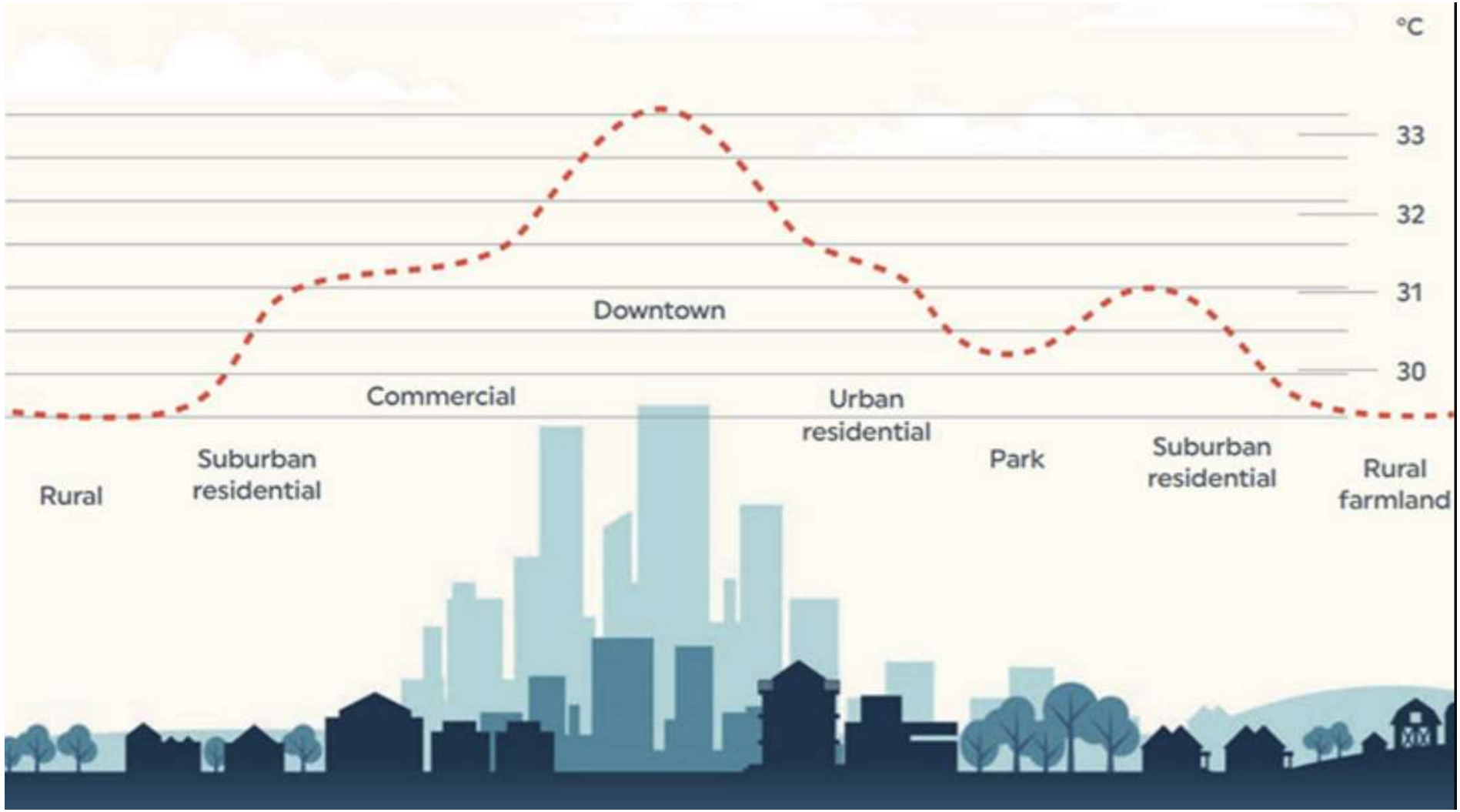
Attributable numbers of all cause deaths in NSW 2006–2018



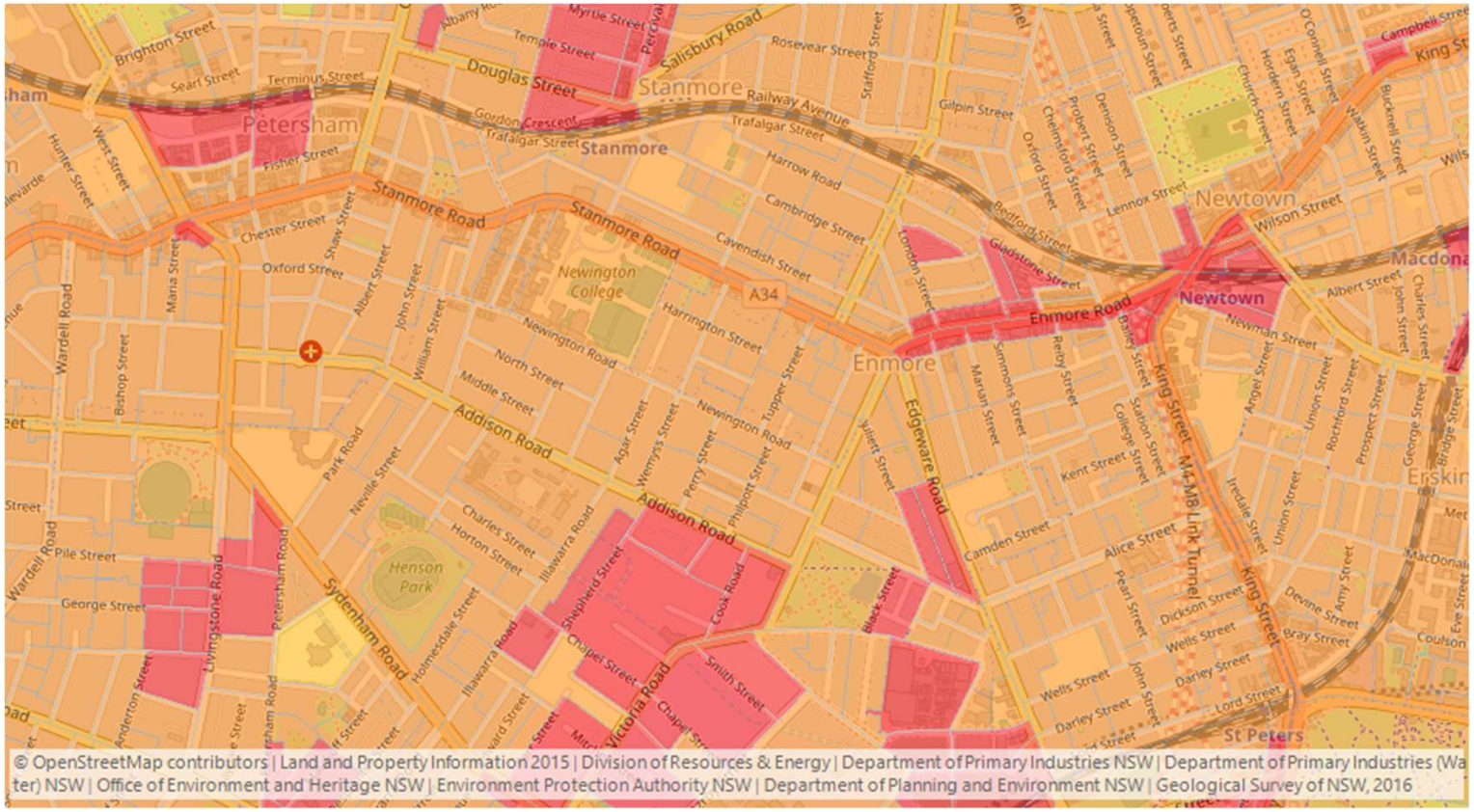
Heat-death modifiers: exposure datasets

- Climate change
  - NARClim: NSW DPIE have produced climate change models that can be used to predict numerous meteorological parameters for immediate, medium term and far future time periods
- Urban heat island (UHI)
  - Seed (NSW Government) provide meshblock UHI land surface temperature anomalies based on IR satelite imaging
- Vegetation cover
  - Seed provide meshblock estimates of percent vegetation cover based on IR satelite imaging

Urban heat island (UHI)

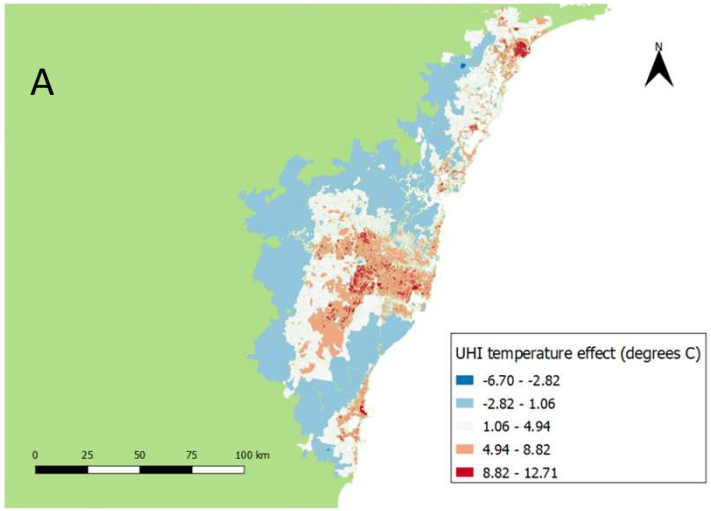


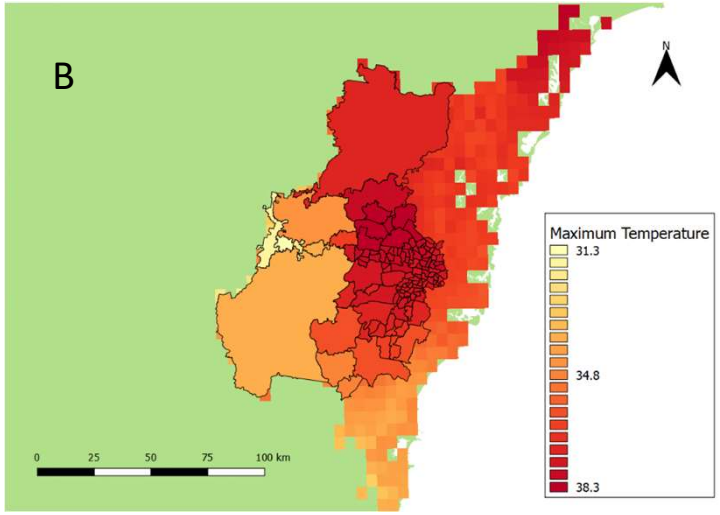
Urban heat island to mesh block



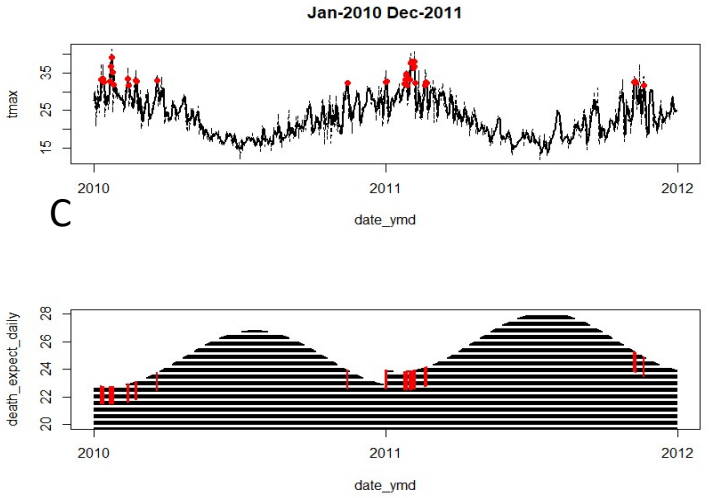
Green, < 0°C; yellow, 0–3°C; light orange, 3–6°C; dark orange, 6–9°C; red > 9°C

UHI surface temperature anomaly





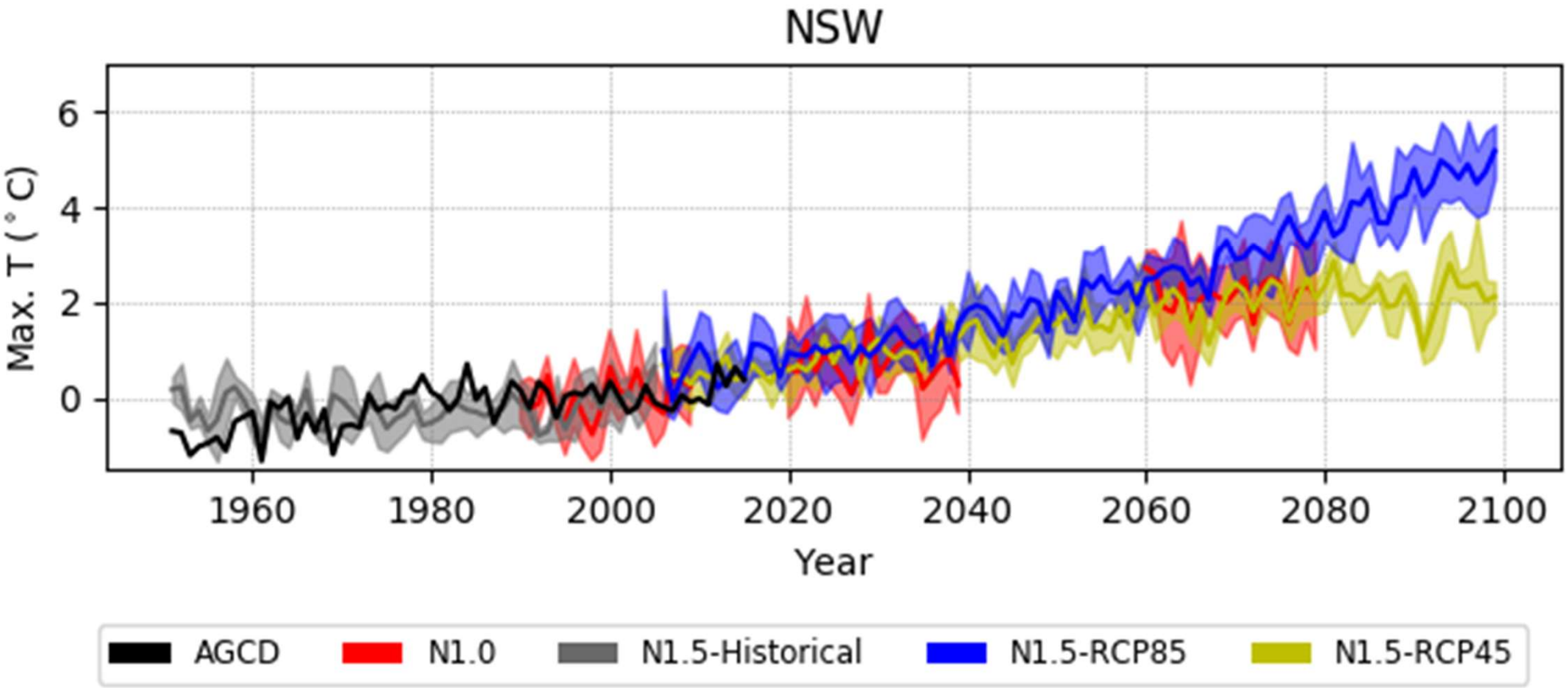
- Land surface temperatures (A) are typically 3°C higher than air temperatures (B) in urban areas, but the two are correlated; R = 0.9 (*Good et al.20xx*).
- Subtract UHI from temperature at MeshBlocks and generate weighted averages for climate zones.



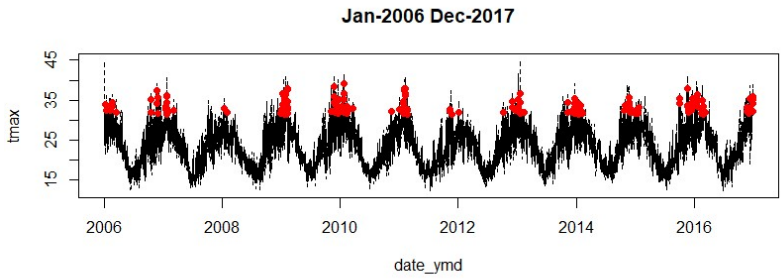
Attributable numbers (AN) of all-cause mortalities in 2017 in Sydney GMR climate zones

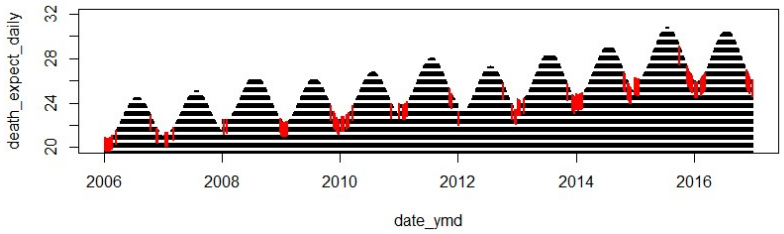
Climatezone	AN heat/100k	AN heat/100k –no UHI	AN	AN – no UHI
Western Sydney	5.00 (1.35 – 8.34)	0.53 (0.15 – 0.81)	176.45 (52.68 - 290.11)	16.41 (5.05 - 24.79)
Eastern Sydney	6.56 (1.95 – 10.78)	0.43 (0.11 – 0.64)	104.23 (28.14 - 173.74)	20.34 (6.09 - 29.97)
Wollongong	7.23 (2.25 – 11.98)	0.39 (0.09 – 0.59)	29.54 (9.09 - 48.55)	3.01 (0.91 - 4.40)
Newcastle	7.93 (2.44 – 13.03)	0.49 (0.16 – 0.75)	16.43 (5.13 - 26.95)	3.39 (1.13 - 5.01)
Wyong	8.38 (2.58 – 13.75)	1.05 (0.29 – 1.62)	11.65 (3.59 - 19.12)	2.33 (0.69 - 3.49)
Gosford	9.37 (2.92 – 15.38)	1.04 (0.32 – 1.56)	22.20 (6.89 - 36.76)	2.38 (0.76 - 3.47)
Total			360.5 (105.52 – 595.23)	47.86 (14.63 – 71.13)

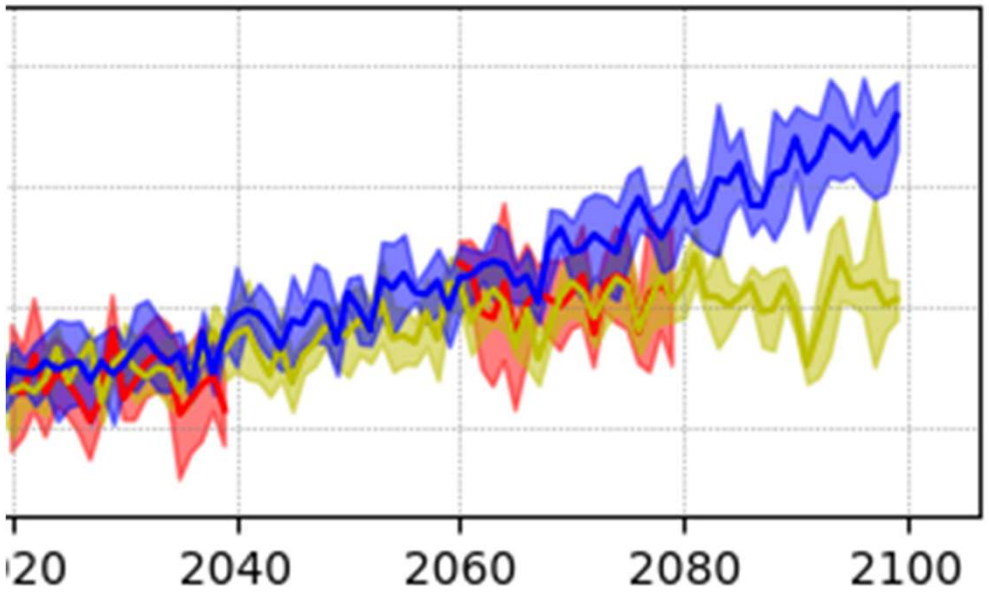
Preliminary Climate Change health impact assessment using NARCliM 1.5



Climate Change Impact Assessment method







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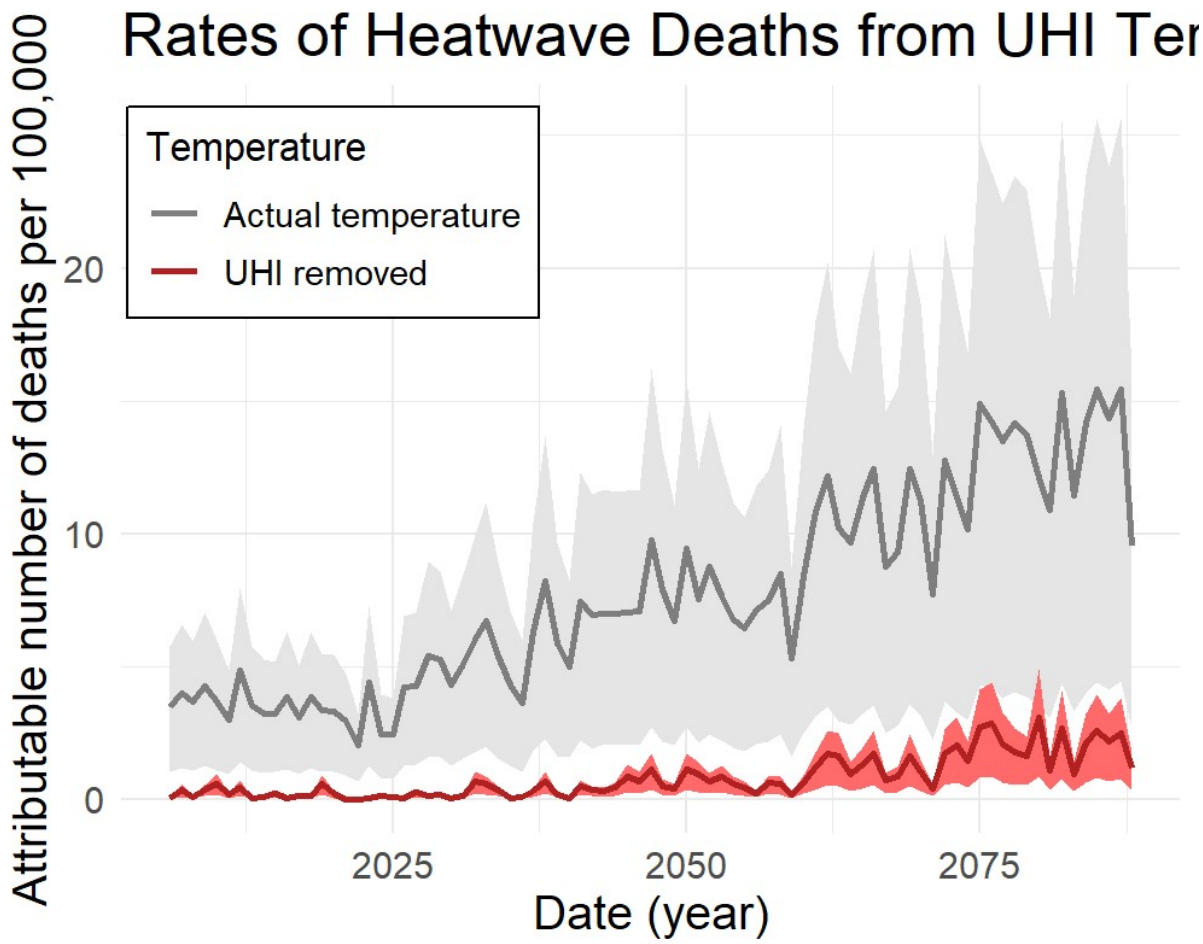
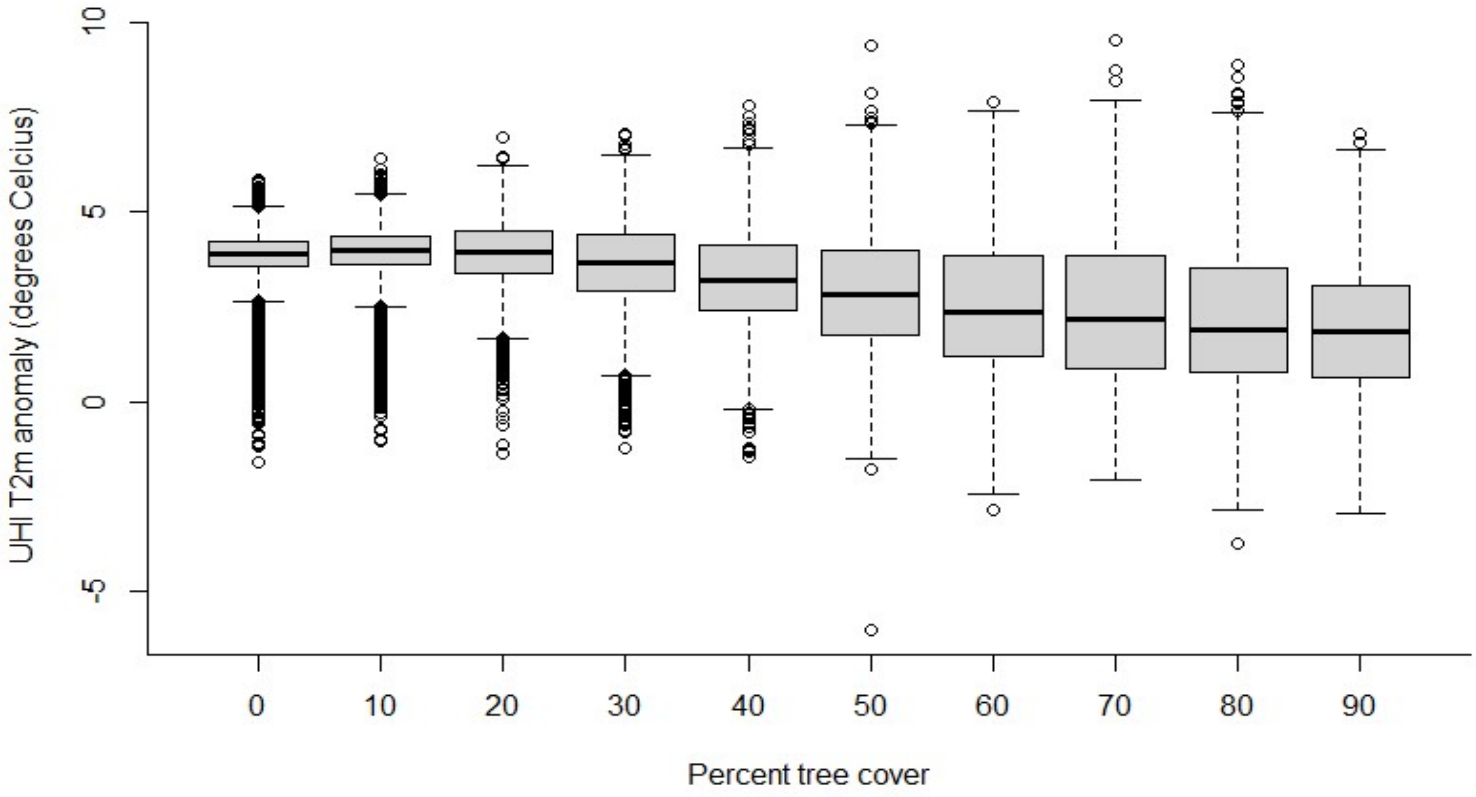
Climate Change Heat Health Burden

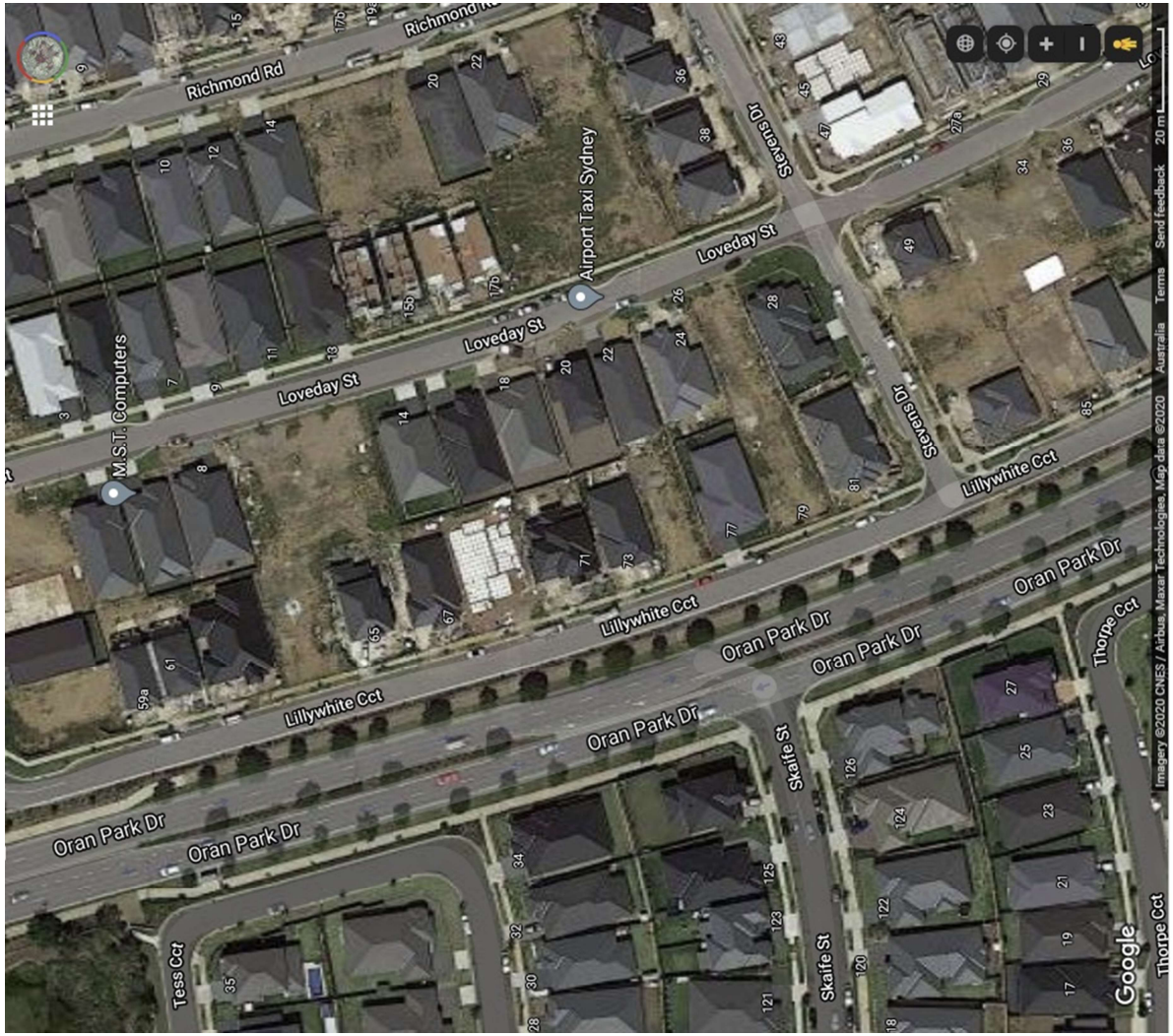
Preliminary
Confidential
Results



Greenspace reduces UHI



Built environment



Policy implications / recommendations for future research

- DPSEEA indicators can guide actions targeted at sensitive subgroups who may be at higher risk of exposure
- Tracking the changing environmental risks and disease burden
- Heat Vulnerability Index (HVI) dataset from NSW DPIE provides areas in which populations are more vulnerable to heat using indicators for exposure, sensitivity and adaptive capacity.
- ACTIONS:
  - Greenspace
  - Urban heat island – exacerbating heatwaves
  - Climate change and health – projections under future climate scenarios to estimate impacts
  - Improved assessment of vulnerability
  - Working with NSW Health to operationalise DPSEEA indicators
  - Targeting interventions and monitoring success

Acknowledgements

- The EH Indicators Project team: Timothy Chaston, Nathan Cooper, Geoff Morgan, Christy Geromboux, Joshua Horsley, Sophie Phelan, Edward Jegasothy, Kathy Heathcote.
- Advisors/ data providers: Ying Zhang, Leigh Wilson, Paul Beggs, Melody Ding, Yuming Guo, Sarah Perkins-Kirkpatrick, Heather Stevens, Tim Driscoll, Melanie Crane, David Schlosberg, Kathleen Beyer, Fei Ji, Joe Miller (NSW DPIE), Ben Scalley, Neil Hime, Richard Broome, and Sanjaya Dissanayake (NSW Health).
- Funding
  - NSW Health
  - NSW Department of Planning, industry and Environment (NSW DPIE)
  - Human Health and Social Impacts (HHSI) Node of the NSW Adaptation Research Hub
- CoESRA (https://coesra.tern.org.au/)
- NHMRC Centre for Air pollution, energy and health Research (CAR) and “CARDAT” data platform (https://cardat.github.io/)

Reducing air conditioner use during hot weather without sacrificing thermal comfort

Presentation 3

Associate Professor Ollie Jay
Director of the Thermal Ergonomics Lab,
University of Sydney

Reducing air conditioner use during hot weather without sacrificing thermal comfort

Ollie Jay[1], Arunima Malik[2], Manfred Lenzen[2], Coen Bongers[1], Richard de Dear[3], Bonnie McBain[4]

[1]Faculty of Medicine & Health, [2]School of Physics, [3]School of Architecture, Planning and Design, [4]University of Newcastle

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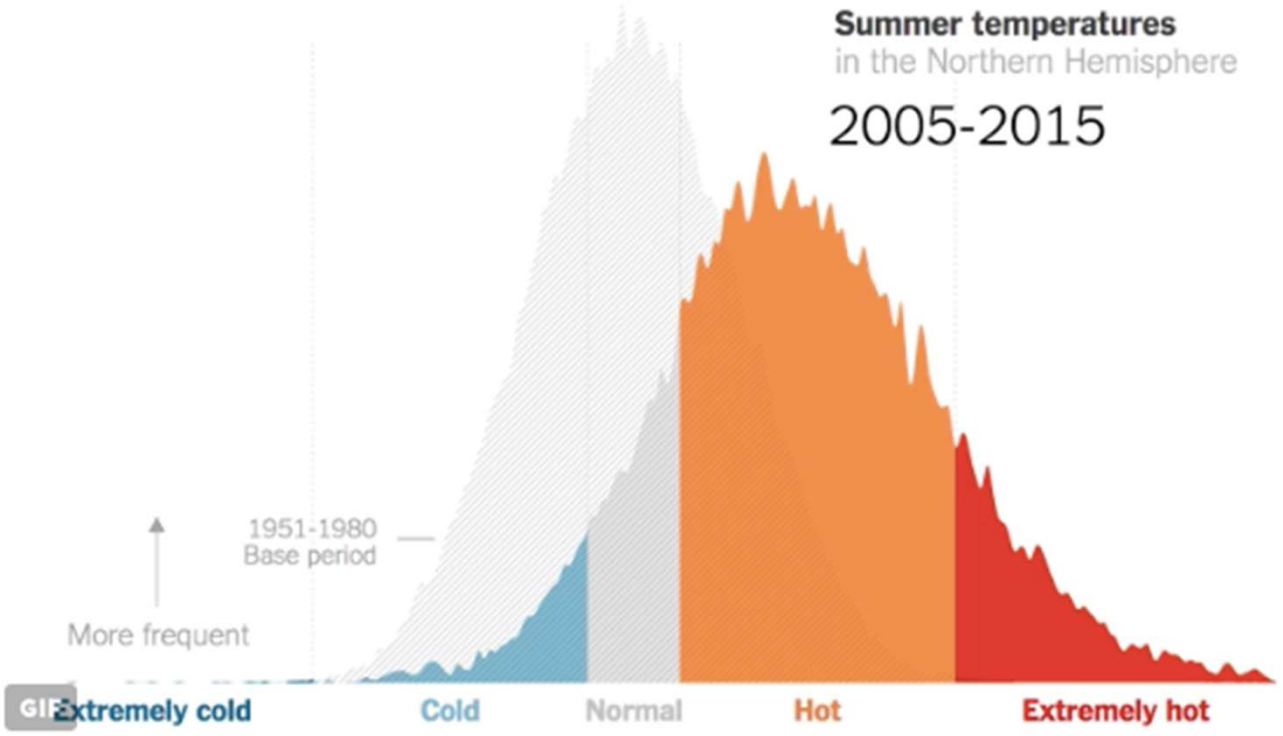
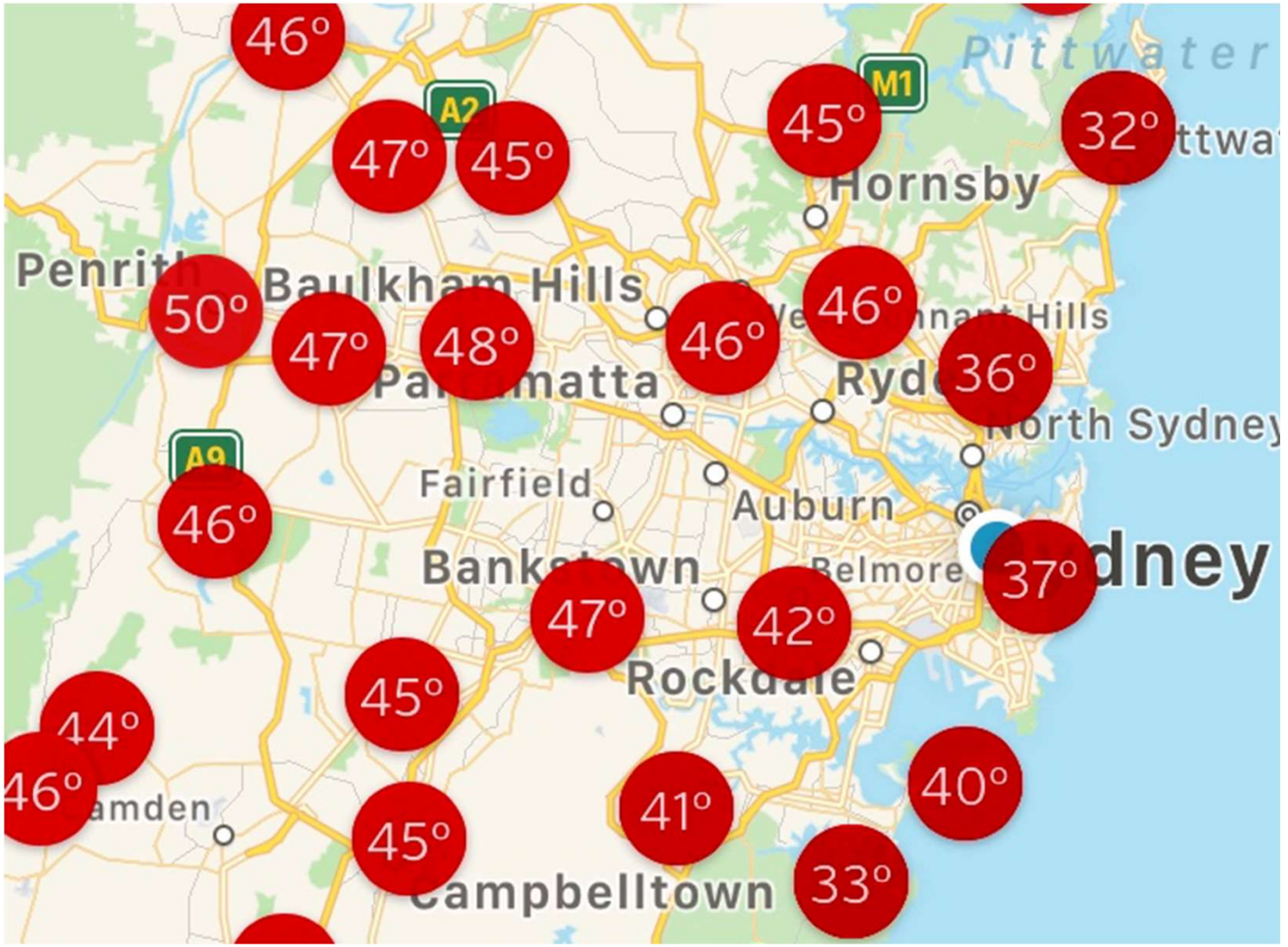
The Changing Climate



New York Times Climate

Jan.4, 2020

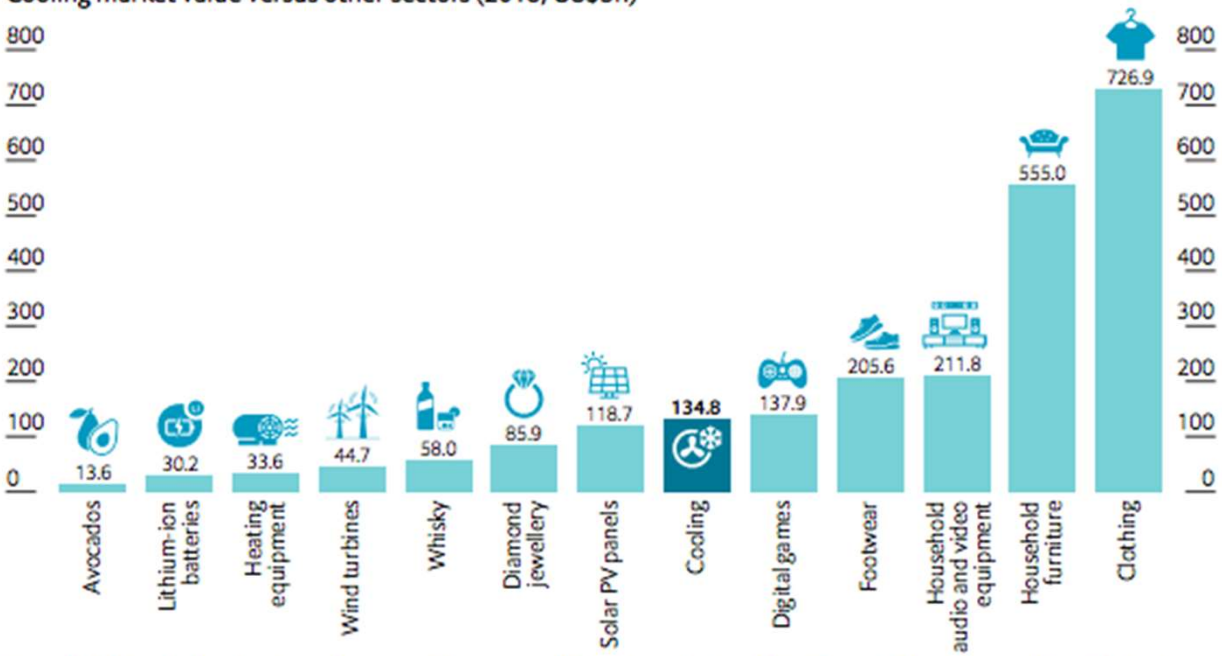

46°
47°
45°
A2
M1
45°
32°
Pittwater
Hornsby
Baulkham Hills
50°
47°
48°
46°
46°
36°
North Sydney
A9
46°
Fairfield
Auburn
Belmore
37°
47°
42°
Rockdale
45°
44°
46°
41°
40°
45°
33°
Campbelltown

Keeping cool....

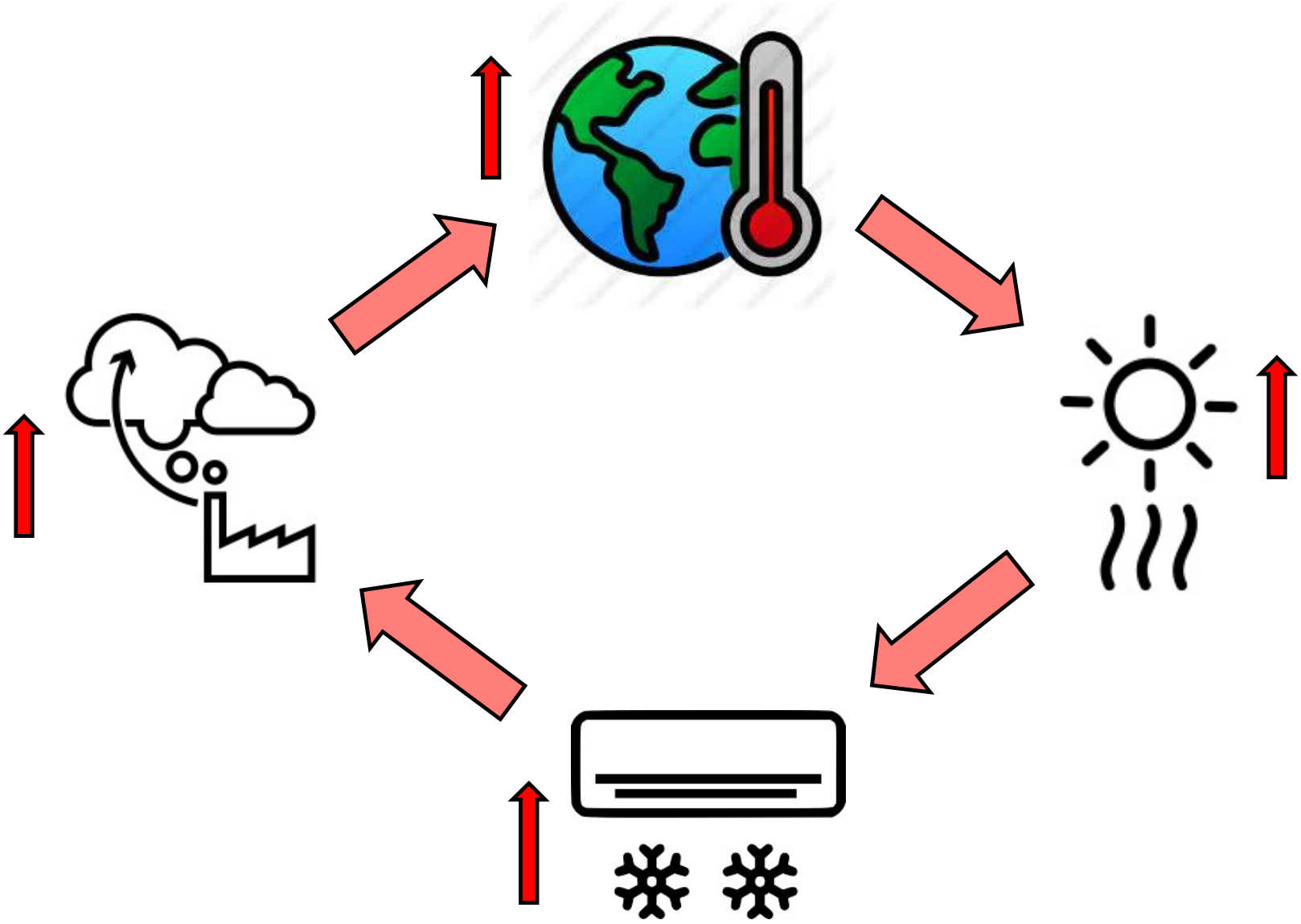
Using Air Conditioning…

Cooling in comparison

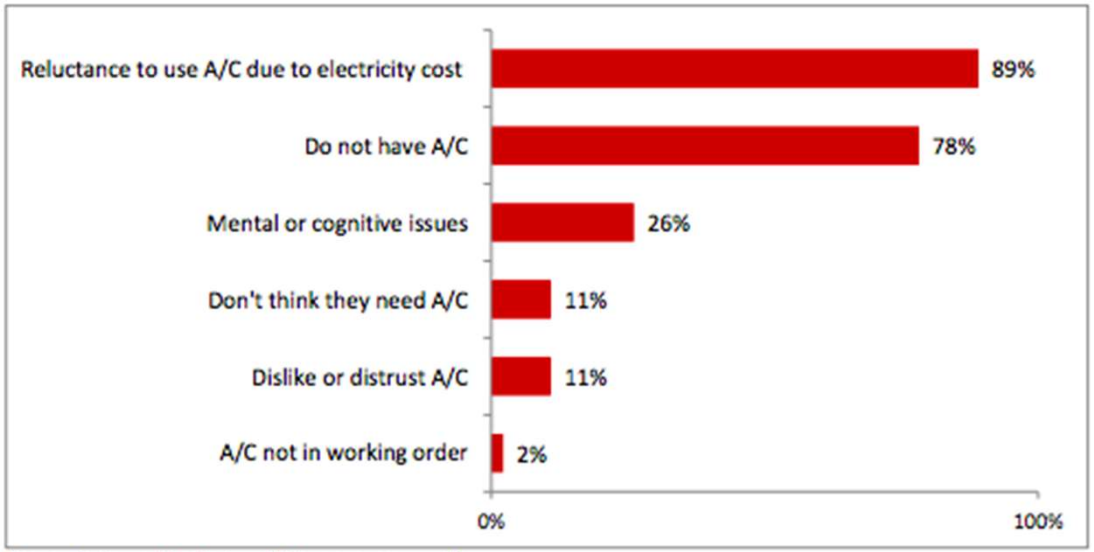
Cooling market value versus other sectors (2018, US$bn)



Source: EIU; Clean Cooling Landscape Assessment; Transparency Market Research; Grand View Research; Alrosa; Newzoo; Power Technology; Allied Market Research

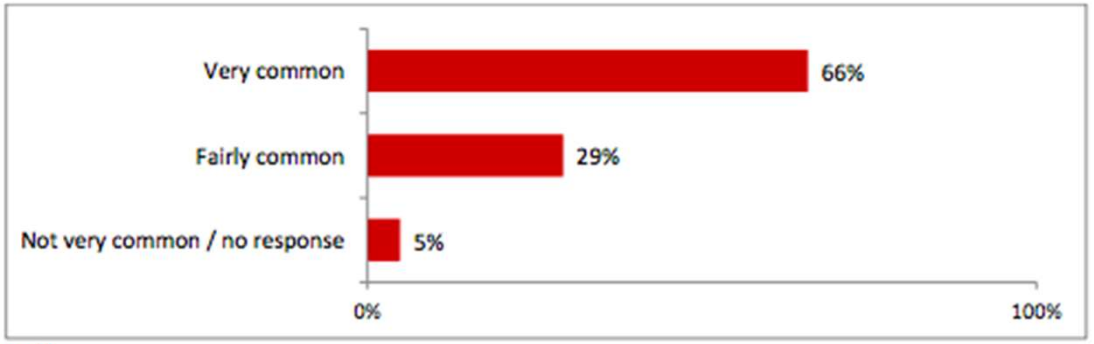


Main reasons survey respondents' clients do not use air conditioning during heatwaves



Respondents could select multiple responses, n=46

How common is it for electricity costs to contribute to client reluctance to use air conditioning?



n=41

RMIT UNIVERSITY | Centre for Urban Research

Nicholls et al. (2017)

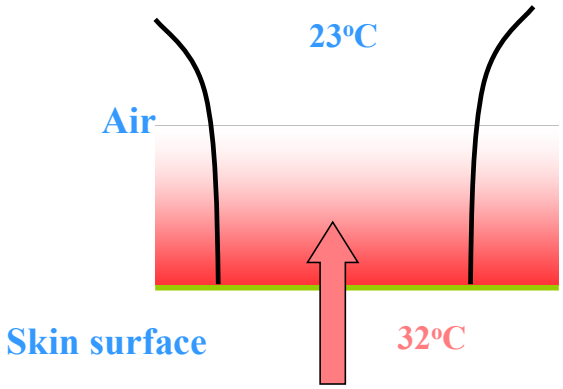
Keeping cool....

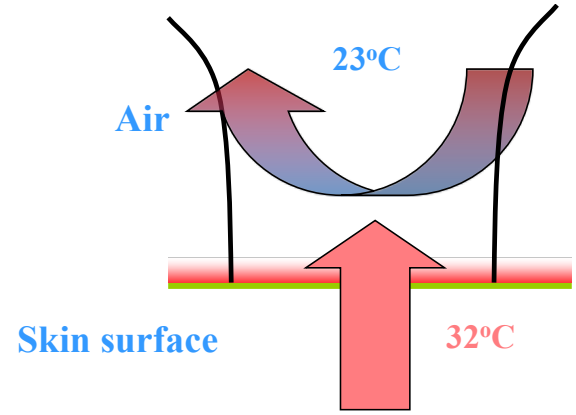
Using AC…

Can we *move* air more and chill it less?

Central Air Conditioning:
3000-5000 W
$2950/year

Electric Fan:
55-100 W
$64/year





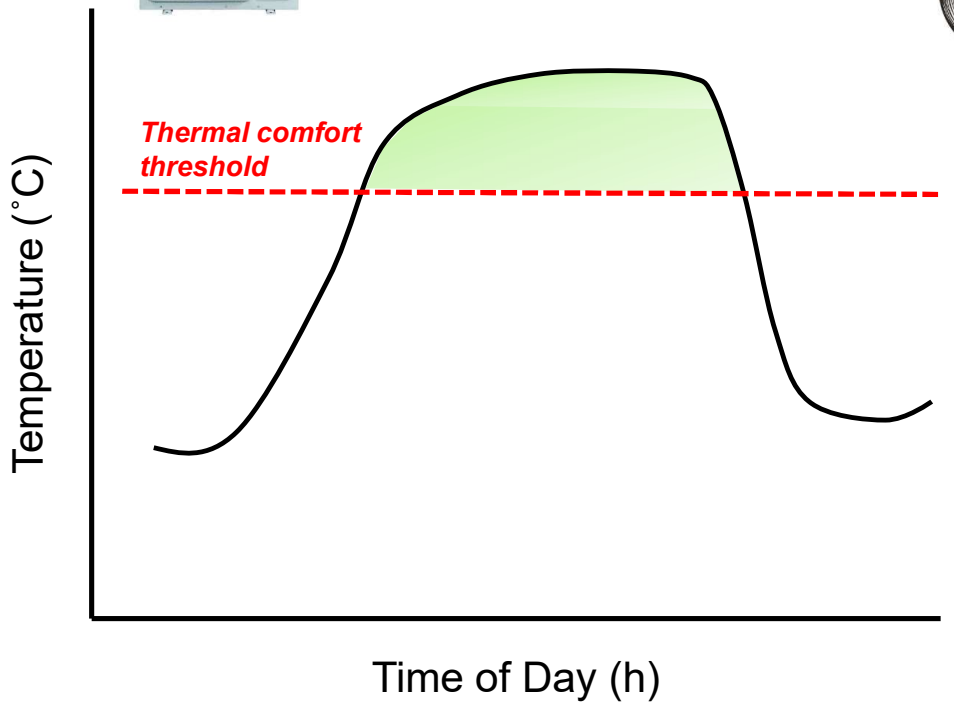
Move air more.. Chill it less?

AIM:

To estimate the influence of increased indoor air movement of different speeds on AC use, electricity consumption, and associated GHG emissions for NSW and Australia

The primary driver of AC use in households is: Thermal Discomfort

↑ wind speed (convection) → ↑ Temperatures for thermal discomfort



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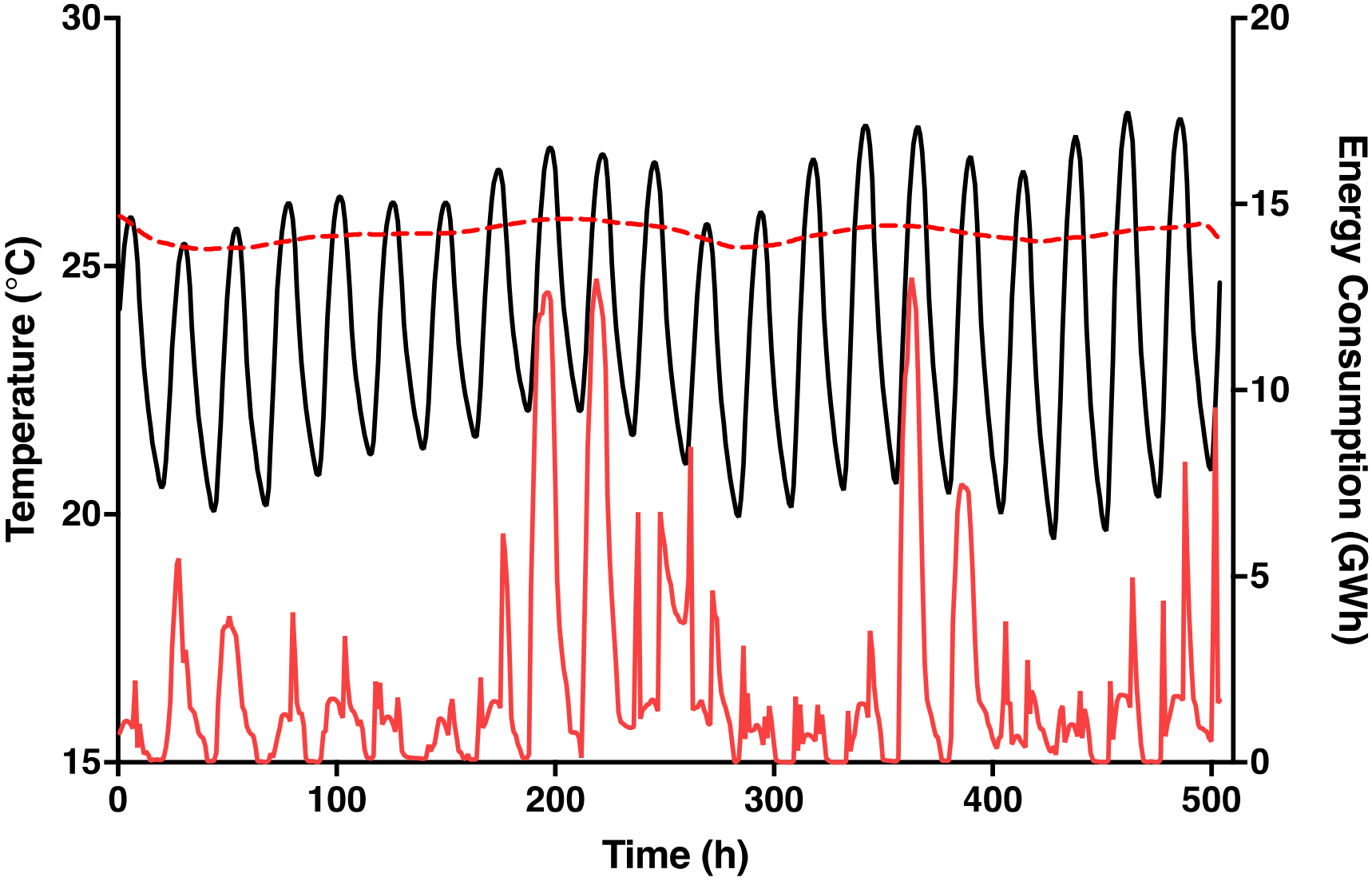
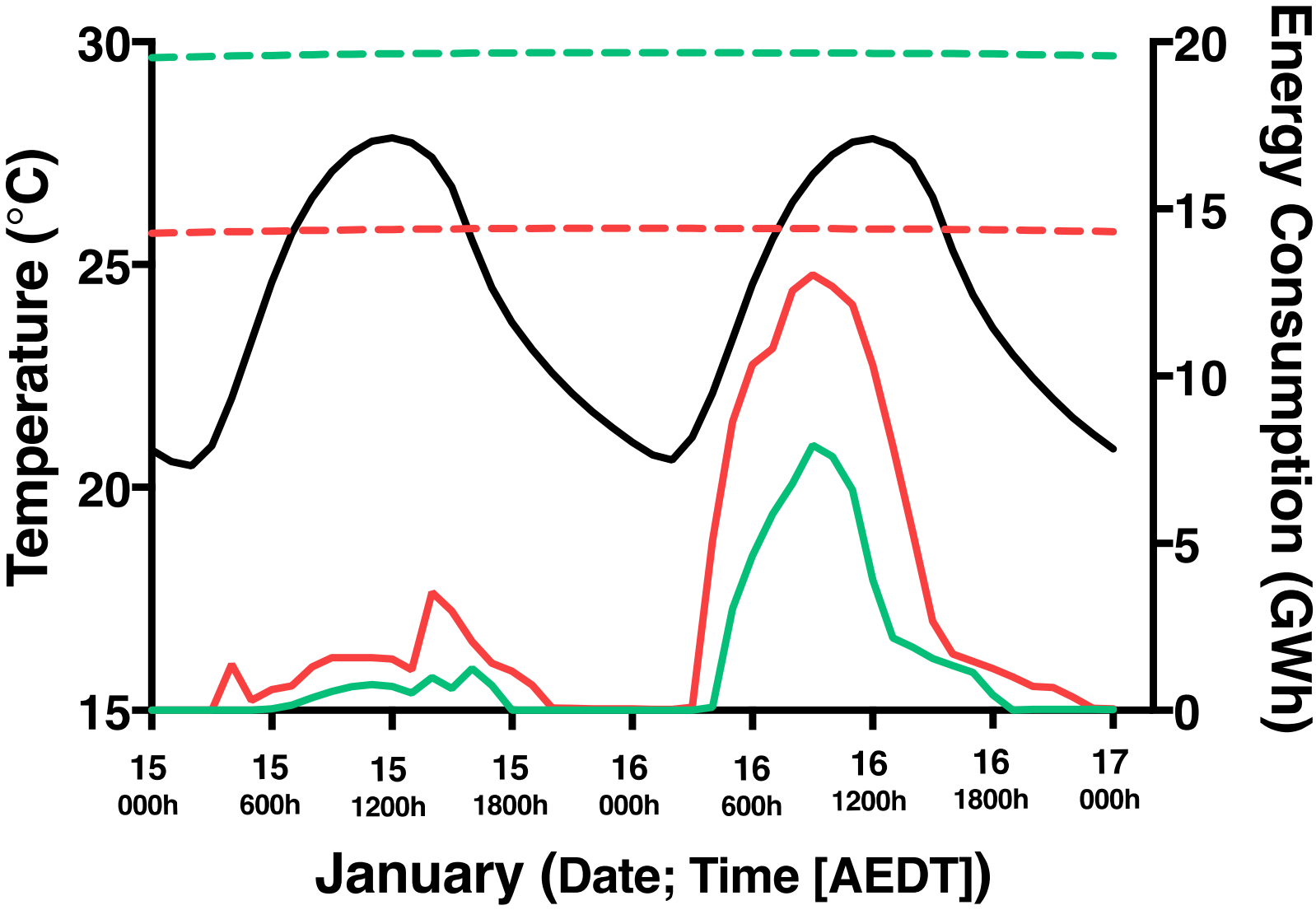
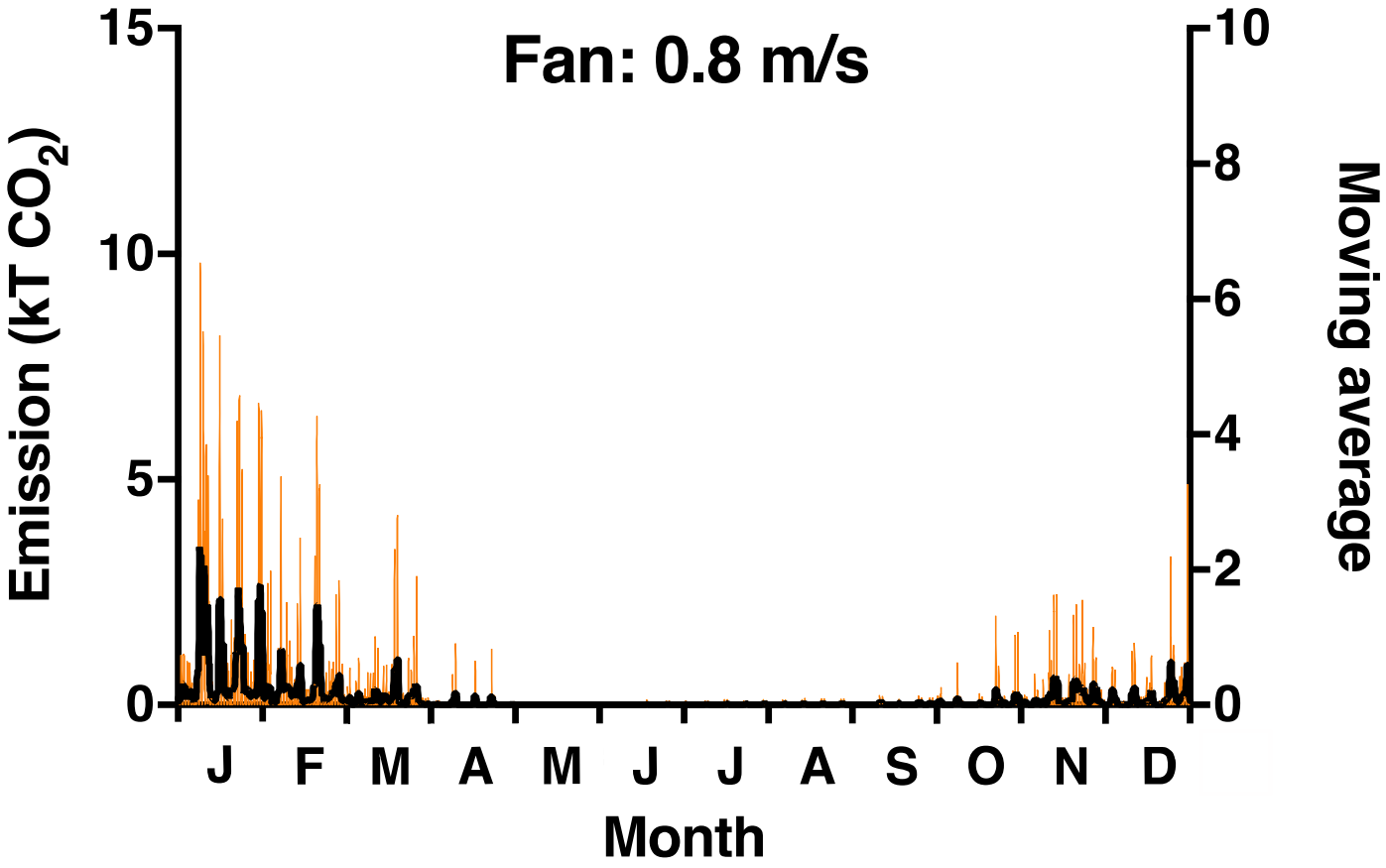
Methods

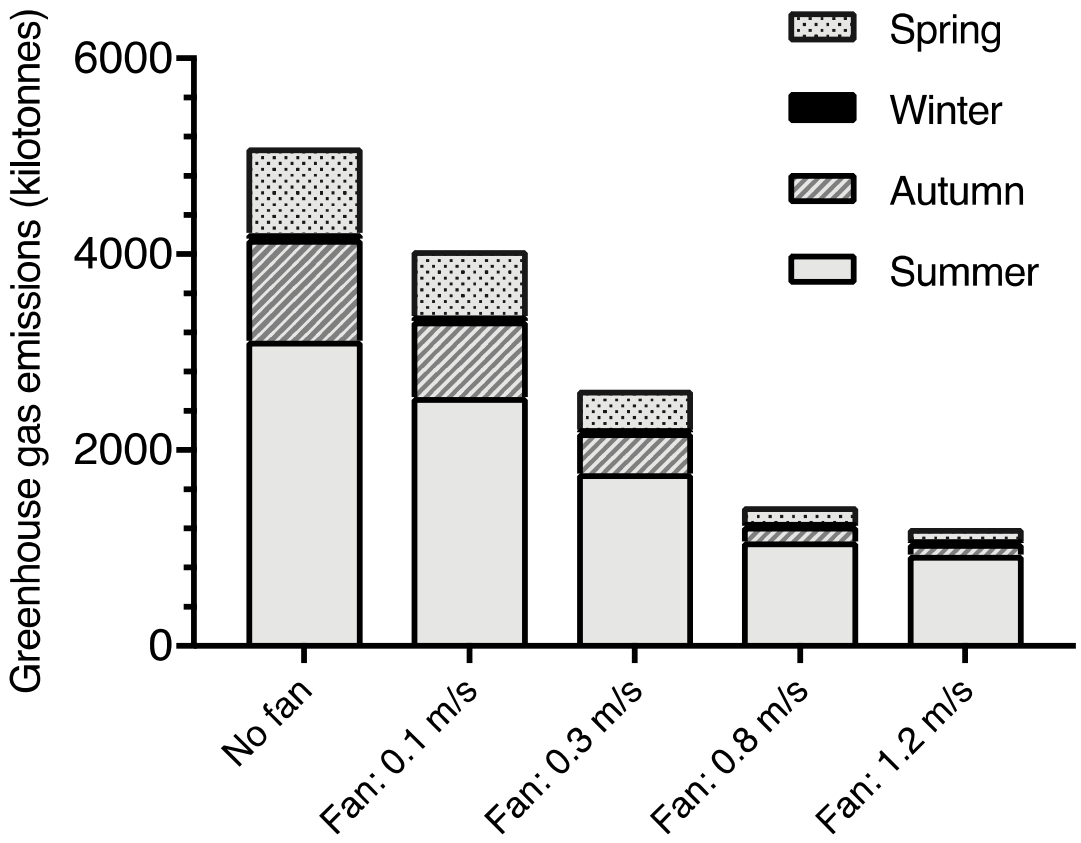
1. Still, 0.1, 0.3, 0.8 and 1.2 m/s
2. Hourly TC threshold > Adaptive TC model (deDear – Usyd)
3. High-resolution Temperature data for 2010 (1/1 - 31/12)
4. Census data on unemployment, avg household size, <5 yo and >65 yo
5. Time of day; Day of week
6. Adjusted for regional differences in power sources


30
25
20
15
Temperature (°C)
20
15
10
5
0
Energy Consumption (GWh)
0
100
200
300
400
500
Time (h)


Temperature (°C)
30
25
20
15
Energy Consumption (GWh)
20
15
10
5
0
15 000h
15 600h
15 1200h
15 1800h
16 000h
16 600h
16 1200h
16 1800h
17 000h
January (Date; Time [AEDT])


Fan: 0.8 m/s
Emission (kT CO_2)
Moving average
15
10
5
0
10
8
6
4
2
0
J
F
M
A
M
J
J
A
S
O
N
D
Month

Findings

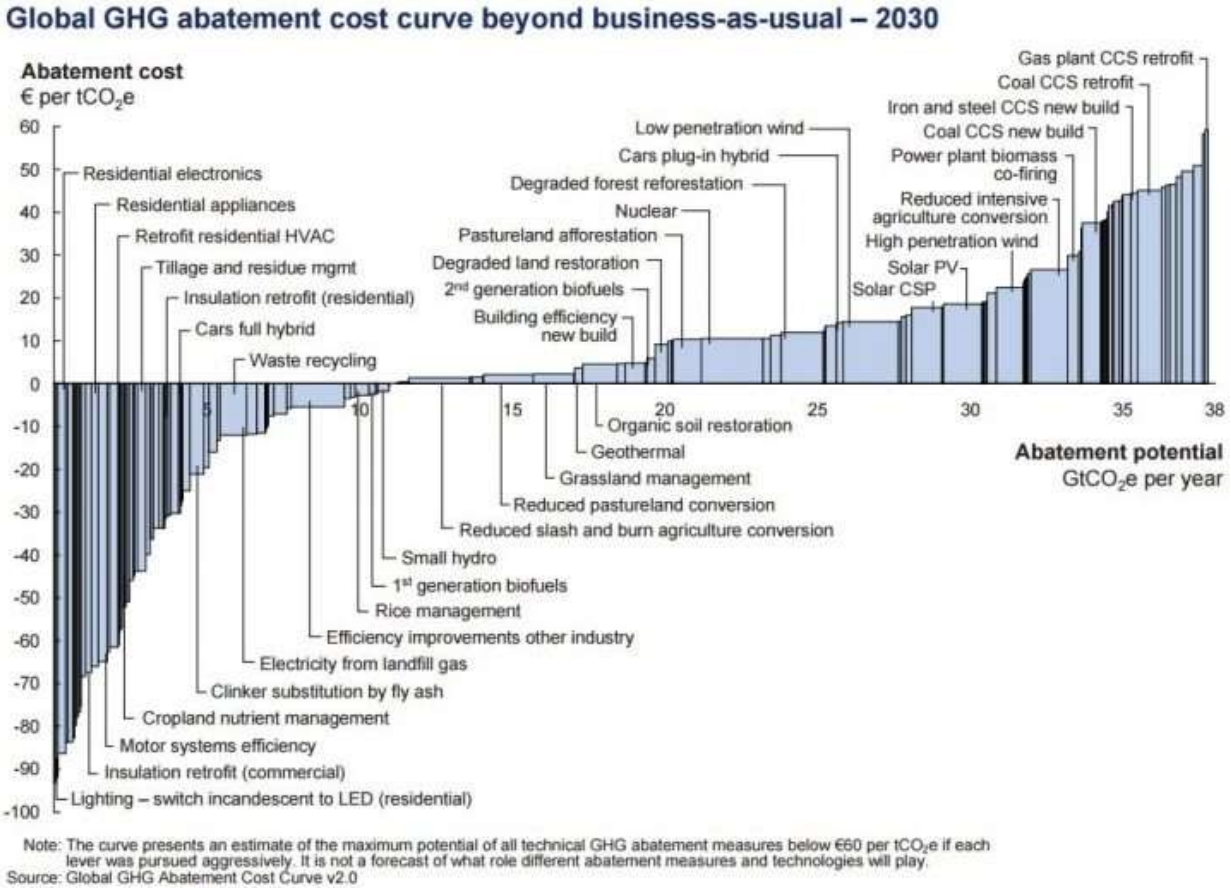


- Air speed increases TC threshold by 2.1-3.5˚C
- Annual reduction in GHGs associated with AC use = 72% (0.8 m/s)
- Equates to ~1% reduction in Australia's GHG emissions

Policy implications?

-95 Euros per tonne of CO_2

-109 Euros per tonne of CO_2



Conclusions

1. A “fan first” strategy with an air speed of 0.8 m/s (medium setting @ ~1 m) raises the temperature threshold for thermal discomfort by 2.5-3.0˚C
2. An associated elevation of the AC thermostat set-point can reduce electricity bills for AC by ~70%
3. Bigger Picture: Residential fan use is a relatively easy and cheap way to support Australia’s goals associated with the 2030 Paris Climate Agreement
4. Likely that our estimates are conservative. 2010 was a relatively cool year. Effects likely much bigger in hotter years and different countries with higher AC use

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Thank you for listening

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@ollie_jay13

Q & A

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Webinar Evaluation

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