



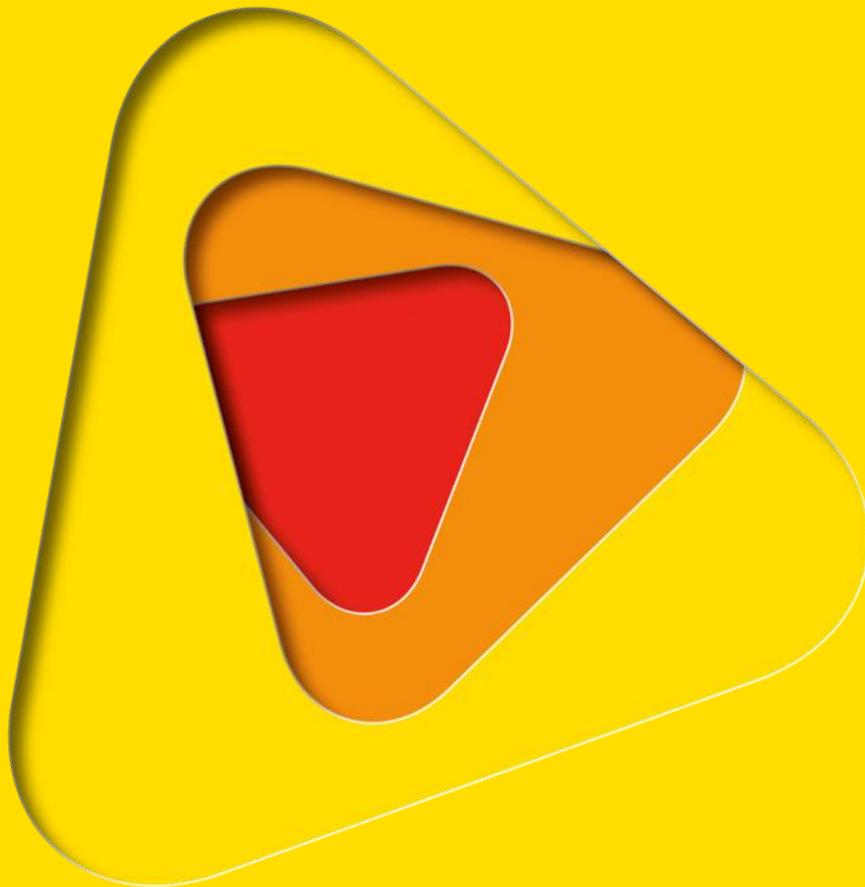
# HEATWAVES IN NEW SOUTH WALES: HOW ARE RESIDENTS AND BUSINESSES COPING?

Non-peer reviewed research proceedings from the Bushfire and  
Natural Hazards CRC & AFAC conference  
Sydney, 4 – 6 September 2017

**Matalena Tofa, Andrew Gissing**

Risk Frontiers  
Bushfire and Natural Hazards CRC

Corresponding author: [matalena.tofa@mq.edu.au](mailto:matalena.tofa@mq.edu.au)





Version	Release history	Date
1.0	Initial release of document	04/09/2017



**Australian Government**  
**Department of Industry,  
 Innovation and Science**

**Business**  
 Cooperative Research  
 Centres Programme

All material in this document, except as identified below, is licensed under the Creative Commons Attribution-Non-Commercial 4.0 International Licence.

Material not licensed under the Creative Commons licence:

- Department of Industry, Innovation and Science logo
- Cooperative Research Centres Programme logo
- All photographs.

All content not licenced under the Creative Commons licence is all rights reserved. Permission must be sought from the copyright owner to use this material.



**Disclaimer:**

Risk Frontiers and the Bushfire and Natural Hazards CRC advise that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, Risk Frontiers and the Bushfire and Natural Hazards CRC (including its employees and consultants) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

**Publisher:**

Bushfire and Natural Hazards CRC

September 2017

Citation: Tofa, M. & Gissing, A. (2017). Heatwaves in New South Wales: how are residents and businesses coping? In M. Rumsewicz (Ed.), *Research Forum 2017: proceedings from the Research Forum at the Bushfire and Natural Hazards CRC & AFAC Conference*. Melbourne: Bushfire and Natural Hazards CRC



## TABLE OF CONTENTS

Abstract	1
Introduction	2
Background	3
Research approach	3
Findings	4
Perceptions and concerns about heatwaves	4
Heatwave impacts and coping strategies	4
Warnings and preparedness	5
Conclusion	6
References	7



## ABSTRACT

Heatwaves are recognized as Australia's most deadly natural peril. During the summer 2016/2017, extreme heatwave conditions were experienced across New South Wales (NSW). Forecasts for heatwave conditions are provided by the BoM, and disseminated through traditional and online media, and by other agencies to communities. However, the full impacts of heatwave conditions and the ways in which these warnings are used by the public are not well understood. In this study, phone surveys of residents and business owners/operators were conducted following heatwaves in January and February 2017. These surveys explored how residents and businesses receive and monitor heatwave warnings, preparedness and protective measures taken, risk perceptions, and the impacts of the heatwave on the health and wellbeing of residents and staff, and on business activity. Initial findings show that communities recognise that temperatures are much hotter than previous years. Households are mainly coping with extreme heat by rescheduling outdoor activities, staying at home and running air conditioners and fans. In the main household members have experienced personal discomfort and poor sleep, however, a number of people have reported feeling unwell. Energy use and costs associated with preparedness and protective measures are key areas of concern to communities.



## INTRODUCTION

Heatwaves are increasingly recognised as a critical public health issue, particularly after major events in the US and across Europe [1-3]. Within Australia, more fatalities have been attributed to heatwaves than to all other natural hazards combined [4, 5]. Vulnerability to heatwaves can be understood as medical vulnerability whereby some people experience greater physiological strain to maintain the body's thermal balance in extreme heat conditions [6, 7], energy or water-related vulnerability where people have limited access to cooling strategies [7], and building-related vulnerability where the housing available restricts the ability to adapt or remain cool during extreme heat events [8]. Each of these kinds of vulnerability need to be considered, alongside the extent to which they influence communities' experiences and coping strategies during extreme heat events. Efforts to understand the impacts of heatwaves typically focus on extreme impacts, such as excess morbidity rates or heat-related fatalities, or such quantifiable aspects as energy and water consumption or power cuts [5, 9]. Whilst these impacts are significant, it is also important to understand the broader health, social, and economic impacts of heatwaves.

Warnings and public messaging about heatwaves are an important means of reducing the likelihood and severity of impacts, especially as heatwaves are not a well-known or visible hazard. Studies have highlighted the effectiveness of these messages, with improved public awareness and reduced morbidity during heatwave events [2, 10]. The Bureau of Meteorology (BoM) has developed a methodology to define heatwaves in the Australian context [11, 12], and has introduced a heatwave service that provides regular updates and forecasts [13]. There is much interest in developing and evaluating warning systems and classifications of heatwaves [3, 14, 15], and in understanding how affected communities use warnings and perceive the risks of extreme heat [16, 17].

Here, we report the findings of rapid response projects conducted by Risk Frontiers and the BoM with the support of the Bushfire and Natural Hazards Co-operative Research Centre (BNHCRC). This research considers the experiences of residents and business owners in Western Sydney, and residents in the Northern Rivers region of NSW during heatwave events in early 2017. It focuses on 1) the impacts of heatwaves experienced by residents and businesses; 2) how warnings are received and understood; and 3) preparedness and protective actions taken to reduce the impacts of the heatwave. The BoM aims to use the findings of this study and future surveys to inform the development of its heatwave service, warnings, and updates. The study delivers valuable knowledge on key issues of risk perception and how residents and businesses respond to heatwave warnings and cope with extreme heat.



## BACKGROUND

There were three main heat events in early 2017. The first was from 10-14 January and affected northern NSW and southern Queensland, the second was from 17-21 January and was experienced mostly in Queensland, and the final and most severe heatwave was from 31 January till 12 February [18]. During this summer, northern NSW experienced more than 55 days where the temperature was over 35°C, while Sydney experienced 35 days with heatwave conditions [18]. In January, peak temperatures in the Northern Rivers region were reached on 18 January, with Casino and Grafton recording 41.3°C. In February, daily maximum temperatures in Penrith (Western Sydney) during the heatwave were between 36.4°C and 46.9°C, while Parramatta North daily maximum temperatures were between 35°C and 44.5°C (BoM, n.d.-a). Through each of these events, the BoM's Heatwave Service provided forecasts.

## RESEARCH APPROACH

Here we report on the findings of three telephone surveys conducted as rapid response projects following heatwaves in NSW. First, a telephone survey of 150 residents affected by the heatwaves in the North Rivers Region of New South Wales (NSW) on 10-14 and 17-21 January 2017 was conducted in February. This region was chosen as it experienced severe and extreme heatwave conditions during these heat events. Second, a telephone survey of 101 residents affected by the heatwave in Western Sydney was conducted in February and March. Suburbs in two regions were targeted (see **Error! Reference source not found.**); suburbs in The Hills region had a Socio-Economic Indexes for area (SEIFA) score above 1000, and while those in the Western suburbs had an SEIFA score below 1000. Lastly, a telephone survey of businesses in Western Sydney was conducted. This survey targeted a range of business types located in The Hills and Western suburbs. Western Sydney was chosen as it experienced severe and extreme heatwave conditions during February, and regularly experiences higher temperatures than other parts of Sydney. It, therefore, is an apposite site at which to consider the impacts of heatwaves in urban area.

Surveying was carried out by two research assistants; residential surveys were administered between 11am and 7pm on weekdays and the business survey was administered between 9am and 5pm on weekdays. Survey questions were developed in consultation with the BoM.



## FINDINGS

### PERCEPTIONS AND CONCERNS ABOUT HEATWAVES

Heatwaves were perceived as a more severe risk to personal health and safety than severe storms, bushfires and floods, with 56% of residents and 60% of businesses in Western Sydney, and 51% of residents in the Northern Rivers region describing heatwaves as either a high or extreme risk. With regard to the heat in summer 2017, most residents in both locations considered this summer hotter than previous years, and many reported being concerned about the heatwaves. The main concerns residents identified were the potential impacts on physical health and personal discomfort, followed by impacts on vulnerable people. Business owners in Western Sydney were also concerned about the heatwave; the potential impact on employee health and safety was the most frequently mentioned concern, followed by potential impacts on productivity.

### HEATWAVE IMPACTS AND COPING STRATEGIES

The everyday impacts of heatwaves on the health and wellbeing of residents in urban areas is a current research concern [7]. In Western Sydney, almost 60% of residents stated that they felt hot or uncomfortable during the heatwave, and 32% reported having difficulty sleeping. In the Northern Rivers region, the main impact reported was feeling hot and uncomfortable (60.5%), followed by being unable to sleep (21.7%), and feeling unwell (15%). The severity of this heatwave is indicated in such comments as:

*One of the biggest impacts was having everyone at home. No one could go outside, kids just got burnt going out into the yard for a few minutes. The heat here is so insufferable that we are now thinking of relocating back to Western Australia (resident, Northern Rivers region).*

The main actions taken by residents in both sites to reduce the Impacts of extreme heat were using air-conditioning, fans, and staying in a cool part of the house. Notably, few people reported checking in on neighbours, relatives, or friends during the heatwaves.

To better understand the impacts experienced by businesses, absenteeism, productivity, turnover, and disruptions to business during the heatwave are considered. These results provide an indication of the impacts as perceived by business owners. While most businesses (58%) described absenteeism as 'about normal' during the heatwave, and 30% described it as higher than normal. Around half of the businesses described their productivity as 'about normal,' but 41% reported that they had lower than normal productivity during the heatwave. This suggests the potentially significant economic Impacts of heatwaves. Interestingly, for some businesses turnover increased during the heatwave. Like residents, using air-conditioning and fans were the most common measures taken to reduce the impacts of heat, followed by taking more breaks and adjusting work practices. Both residents and businesses reported being concerned about electricity use during the heatwaves.



## WARNINGS AND PREPAREDNESS

In both sites, around 70% of residents reported being warned about the heatwave, and the television was by far the most frequently identified source of information about the heat. Similarly, 78% of business owners in Western Sydney reported being advised about the heatwave, primarily through the television. The main messages recalled by all survey respondents were that 'It is going to be hot' and to 'stay hydrated.' Many residents and businesses took steps to prepare for the heatwave; for example, rescheduling activities and developing a plan for the hot days. Most were satisfied with the warnings and information that they received; however, some expressed interest in more locally-specific and accurate heat predictions, and more advice on how to cope with the heat.

When asked to consider how they could be better prepared for extreme heat events, many residents and business owners responded that no further preparations were needed, or that they were unsure. Several of the suggested ways to better prepare for heatwaves focused on building quality and features, for instance, installing air-conditioning or solar panels, or insulation.

Suggestions for ways that government agencies could better assist communities during heatwaves focused on reducing vulnerability from the built environment and reducing vulnerability due to social and economic factors. Subsidies for electricity was the most common suggestion, followed by subsidies and regulations to encourage installation of solar panels and other improvements to buildings. In addition, many people noted a concern for those without affordable access to air-conditioning and fans. Several people also linked heatwaves to climate change, and suggested that the government should 'take action' to address climate change.



## CONCLUSION

These surveys provide an insight to the impacts experienced by residents and businesses in Western Sydney and residents in the Northern Rivers region during the heatwaves in January and February 2017, and the ways in which warnings were used. The findings highlight the important role traditional media (especially television) plays in informing residents and business owners about heatwaves. The survey of businesses reveals that the perceived impacts on absenteeism, productivity, and turnover were significant for many. The findings also reveal that many residents and business owners rely on air-conditioning to cope with heatwaves, and perceive that little more can be done to prepare. Reducing vulnerability to heat through improved building design (e.g., insulation, air-conditioning, shade), and reducing vulnerability to electricity pricing and outages through solar panels, were the main suggestions to improve preparedness.



## REFERENCES

1. Åström, C., K. Ebi, J. Langner, and B. Forsberg, *Developing a heatwave early warning system for sweden: Evaluating sensitivity of different epidemiological modelling approaches to forecast temperatures*. International Journal of Environmental Research and Public Health, 2014. **12**(1): p. 254-267.
2. Khare, S., S. Hajat, S. Kovats, C.E. Lefevre, W.B. De Bruin, S. Dessai, and A. Bone, *Heat protection behaviour in the uk: Results of an online survey after the 2013 heatwave*. BMC Public Health, 2015. **15**(1).
3. Toloo, G., G. Fitzgerald, P. Aitken, K. Verrall, and S. Tong, *Evaluating the effectiveness of heat warning systems: Systematic review of epidemiological evidence*. International Journal of Public Health, 2013. **58**(5): p. 667-681.
4. Commonwealth Government, *Protecting human health and safety during severe and extreme heat events: A national framework*. 2011, Pricewaterhouse Coopers: Australia.
5. Coates, L., K. Haynes, J. O'brien, J. Mcaneney, and F.D. De Oliveira, *Exploring 167 years of vulnerability: An examination of extreme heat events in australia 1844-2010*. Environmental Science and Policy, 2014. **42**: p. 33-44.
6. Hansen, A., P. Bi, D. Pisaniello, M. Nitschke, G. Tucker, J. Newbury, . . . L. Kelsall, *Heat-health behaviours of older people in two australian states*. Australas J Ageing, 2015. **34**(1): p. E19-25.
7. Hatvani-Kovacs, G., M. Belusko, N. Skinner, J. Pockett, and J. Boland, *Heat stress risk and resilience in the urban environment*. Sustainable Cities and Society, 2016. **26**: p. 278-288.
8. Hatvani-Kovacs, G., M. Belusko, N. Skinner, J. Pockett, and J. Boland, *Drivers and barriers to heat stress resilience*. Science of the Total Environment, 2016. **571**: p. 603-614.
9. Hatvani-Kovacs, G., M. Belusko, J. Pockett, and J. Boland, *Assessment of heatwave impacts*. Procedia Engineering, 2016. **169**: p. 316-323.
10. Nitschke, M., G. Tucker, A. Hansen, S. Williams, Y. Zhang, and P. Bi, *Evaluation of a heat warning system in adelaide, south australia, using case-series analysis*. BMJ Open, 2016. **6**(7): p. e012125.
11. Nairn, J.R. and R.J. Fawcett, *The excess heat factor: A metric for heatwave intensity and its use in classifying heatwave severity*. International Journal of Environmental Research and Public Health, 2014. **12**(1): p. 227-53.
12. Nairn, J.R. and R.J. Fawcett, *Defining heatwaves: Heatwave defined as a heat-impact event servicing all community and business sectors in australia*, in *CAWCR technical report*. 2013, CSIRO and the Bureau of Meteorology: South Australia.
13. Bom. *Heatwave service for australia*. n.d. 10.03.2017]; Available from: <http://www.bom.gov.au/australia/heatwave/>.
14. Lowe, D., K.L. Ebi, and B. Forsberg, *Heatwave early warning systems and adaptation advice to reduce human health consequences of heatwaves*. International Journal of Environmental Research and Public Health, 2011. **8**(12): p. 4623-4648.
15. Loridan, T., L. Coates, D. Argueso, S. Perkins-Kirkpatrick, and J. Mcaneney, *The excess heat factor as a metric for heat-related fatalities: Defining heatwave risk categories*. Australian Journal of Emergency Management, 2016. **31**(4): p. 31-38.
16. Akompab, D.A., P. Bi, S. Williams, J. Grant, I.A. Walker, and M. Augoustinos, *Awareness of and attitudes towards heat waves within the context of climate change among a cohort of residents in adelaide, australia*. Int J Environ Res Public Health, 2012. **10**(1): p. 1-17.
17. Saniotis, A., A. Hansen, D. Kralik, P. Arbon, M. Nitschke, and P. Bi, *Building community resilience to heatwaves in south australia*. Transactions of the Royal Society of South Australia, 2015. **139**(1): p. 113-120.
18. Bom, *Special climate statement 61—exceptional heat in southeast australia in early 2017*. 2017, Bureau of Meteorology, Australian Government.