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# **The Consequences of Heatwaves in Australia**

by

Kylie Andrews

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## ABSTRACT

Heatwaves are one of the least studied and most underrated natural hazards in Australia. This thesis has undertaken the first step towards the recognition of the significance of heatwaves as a natural hazard, by investigating the consequences of heatwaves in Australia. Most of this analysis focuses on Australia, with Sydney and Broken Hill utilised as study sites for more specific analyses.

Like droughts, heatwaves are difficult to define, and there is no official definition of a heatwave in Australia. Three heatwave definitions are proposed to represent three broad definitional methodologies:- media defined, a universal definition and a location-specific definition. These definitions are applied to Broken Hill and Sydney temperature data in order to investigate the applicability of the definitions, and to provide a sense of the frequency and severity of heatwaves in Australia. The most significant findings of this investigation are the inadequacy of a pervasive heatwave definition, and the problems involved in quantifying what is essentially a subjective experience. Again, similar to droughts, a general and useful definition of a heatwave may be impossible.

The consequences of heatwaves on human mortality and lifelines are addressed. Total deaths caused by heatwaves indicate that in terms of this parameter, heatwaves are the most significant natural hazard in Australia (excluding disease hazards). Over 4,000 deaths have been attributed to heat in Australia since 1803 and this figure underestimates the real toll of heatwave-associated mortality. In addition to deaths caused directly by heat, this study indicates that mortality from all causes increases in Sydney during heatwaves. The isolation of vulnerable population groups, activities, locations and time periods has been achieved by this analysis.

Heatwaves also affect lifelines in Australia. Water consumption increases significantly with temperature in Sydney and water shortages, restrictions and supply failures have occurred in the past in conjunction with heatwaves. Effects on electricity consumption and transport links are also demonstrated in this thesis.

The analysis of future risk of heatwaves, dependant on the interaction of projected climate change and social change, suggests that the risk of heatwaves will increase in the future. The examination of an hypothesised relationship between heatwaves and El Niño-Southern Oscillation (ENSO) yielded negative results; it appears that no relationship exists.

In addition to taking the first step towards understanding the significance of heatwaves in Australia, this thesis highlights several areas for future study into the consequences of heatwaves in Australia.

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