Risk Frontiers

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Sydney's Heatwave, January 2011

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While all the attention was focused on the Queensland floods and Cyclone Yasi, Sydney was warming up for one of the most intense heatwaves ever seen by the city.

From 30th January to 6th February 2011 the Sydney metropolitan region experienced its longest heatwave ever recorded, when Observatory Hill reached seven consecutive days above 30ºC, passing the previous record by two days. Western Sydney and the Hunter Region also had many records broken, with Richmond and Cessnock experiencing six consecutive days above 38ºC and 39ºC respectively, breaking the previous records of five days and three days (BOM 2011).

Little relief was felt at night with minimum temperature anomalies extending across much of NSW. Sydney's Observatory Hill set new records of five consecutive nights above 24ºC (the previous record was just two nights).

Records for both minimum and maximum daily temperatures were broken in several locations across the state, most notably Sydney's Observatory Hill recorded a minimum of 27.6ºC on the 6th February, breaking the previous record by 1.0ºC.

Recorded temperatures at Sydney's Observatory Hill for can be seen in Figure 1, and Australia-wide temperature anomalies for both maximum and minimum temperatures on the 6th February 2011 are shown in Figures 2a and 2b.

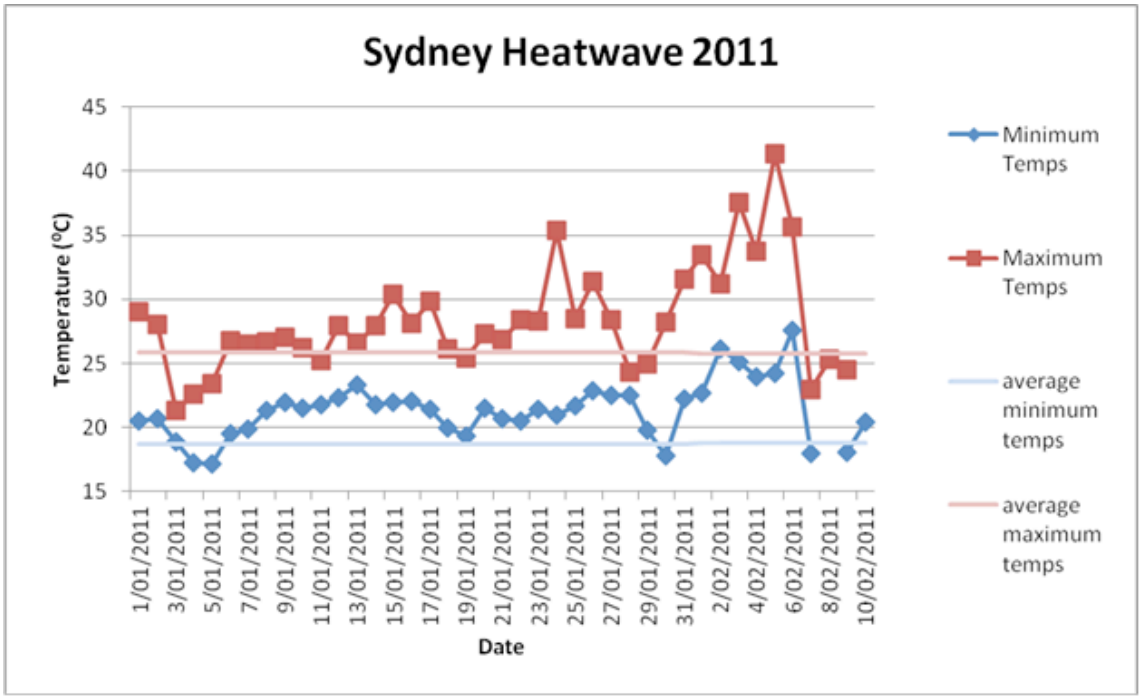
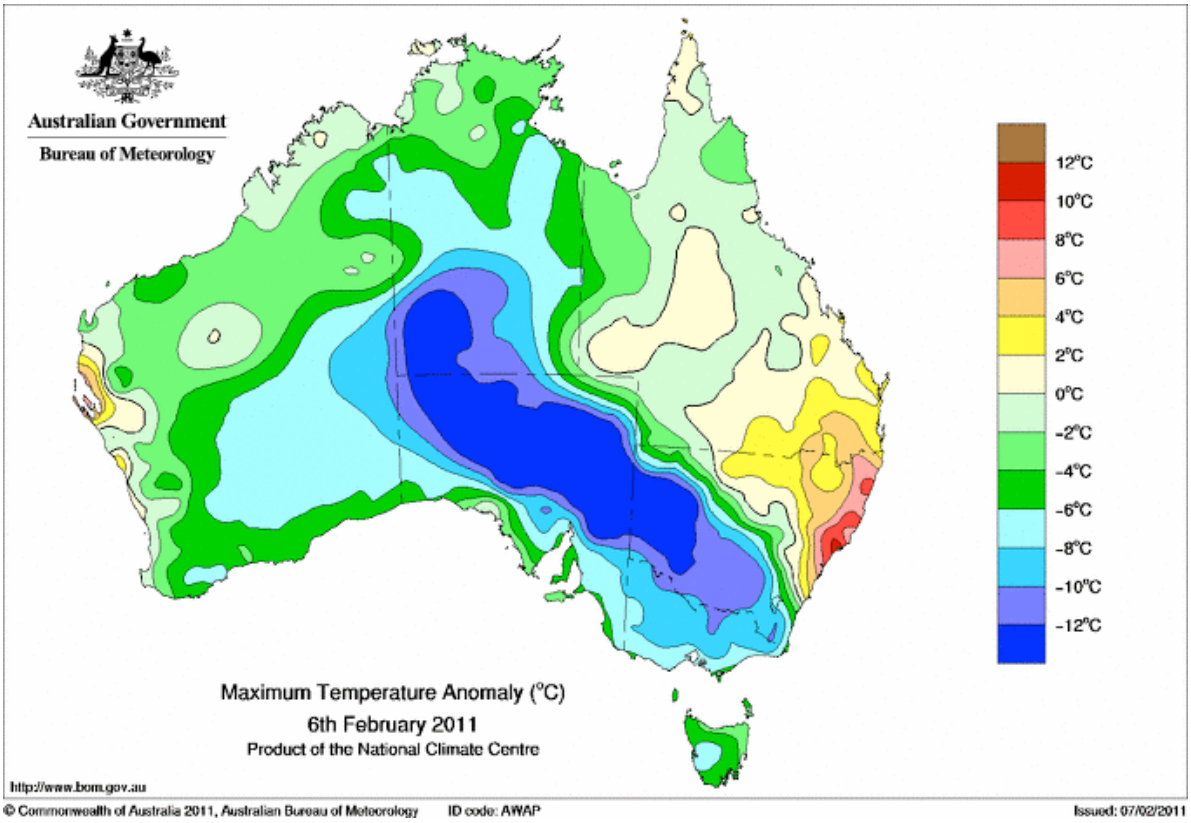


Figure 1 – Maximum & minimum temperatures for Sydney Observatory Hill for January & February 2011



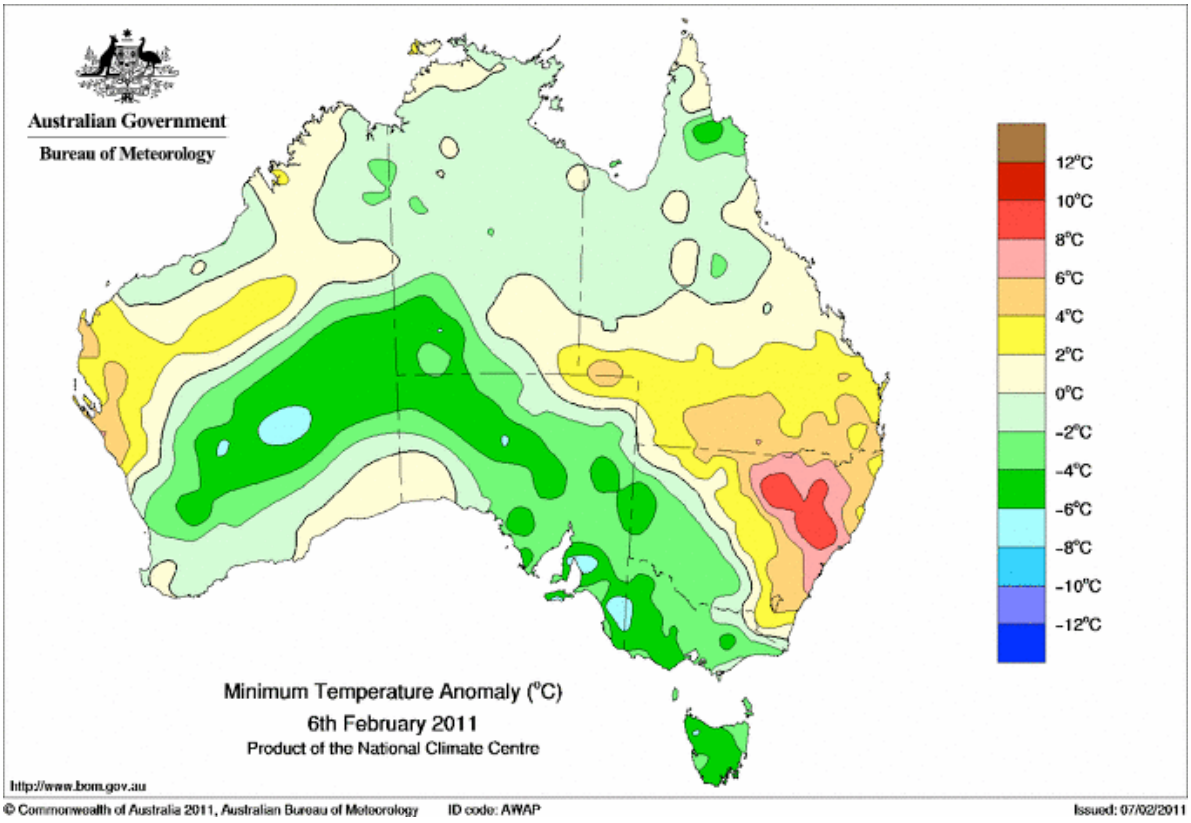
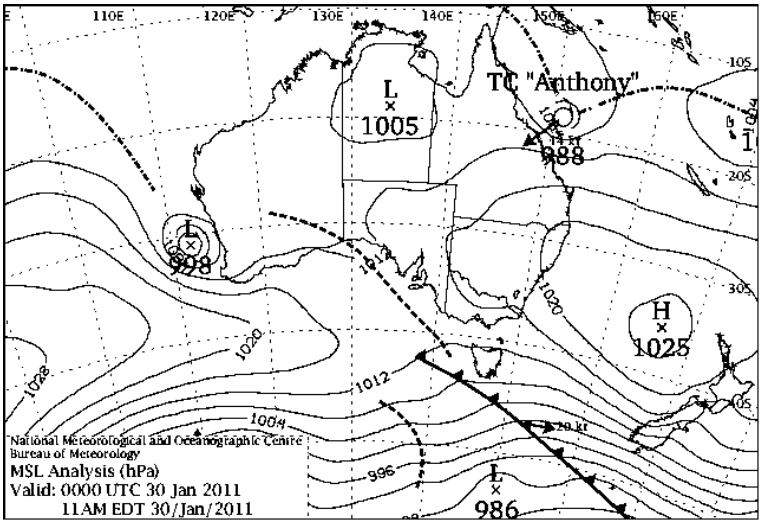


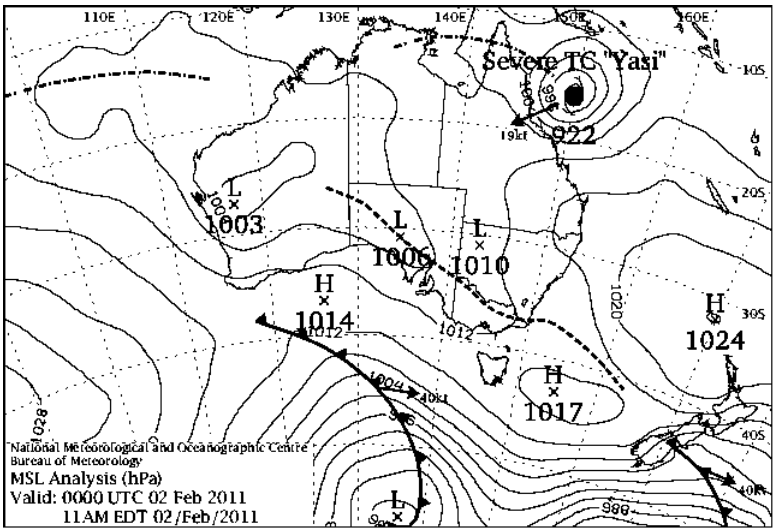
Figure 2 a & b – Australian Temperature anomalies for 6th February 2011

In addition, above average sea surface temperatures off the east coast of Australia, as well as above average moisture in inland NSW following TC Anthony and TC Yasi resulted in above average humidity across NSW (BOM 2011).

But what caused this event?

The event was largely the result of a semi-stationary high pressure system in the Tasman Sea, (see Figures 3a, b & c) which directed north- to north-easterly winds across NSW. Such 'blocking highs' are not unusual, but the persistence of this system over more than two weeks is almost unprecedented in the summer half of the year. More often 'blocking highs' occur in late autumn and winter and are therefore associated with much lower temperatures (BOM 2008).





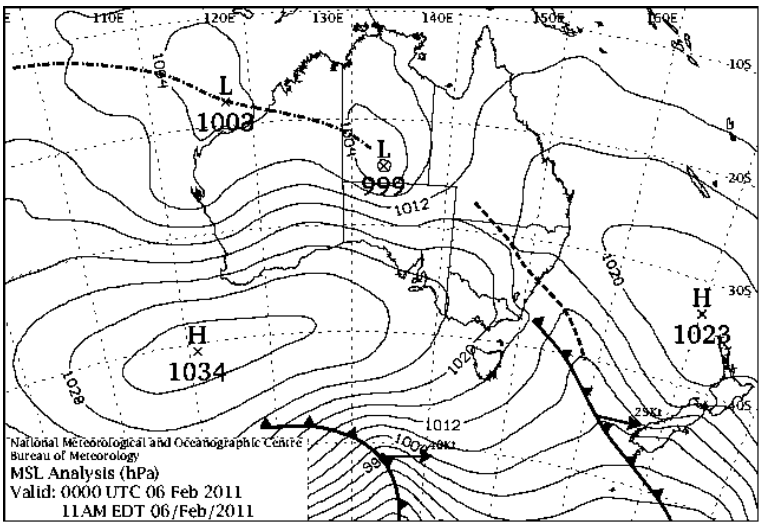


Figure 3a, b and c – MSLP Analysis showing the persistent high pressure system in the Tasman Sea

But apart from feeling hot how does it impact us?

The human body is very efficient at warming itself but not as efficient when it comes to cooling itself down. The apparent temperature heat index (Ta) devised by Stedman (1979) uses both air temperature and relative humidity to establish a 'feels like' temperature (Table 1). This index has become a useful tool to evaluate heat-related stress. Exposure to excessive temperatures can result in heat cramps (Ta>32), heat exhaustion (Ta>40) and heat stroke and ultimately death (Ta>54) if left untreated.

The Sydney Morning Herald (2011) reported that the Ambulance Service of NSW had responded to 213 heat-related calls over the duration of the heatwave event, with 106 of those within the Sydney metropolitan area. Personal communication with a number of ambulance officers conveyed that there were many calls to 'nausea & dizziness' throughout the week. NSW Health have said that while there appears to have been an increase in deaths it would take a number of weeks to establish the numbers accurately, as the deaths of many people with chronic conditions are not recorded as heat-related (SMH 2011).

Table 1 – Apparent Temperature Heat Index

Relative	Atmospheric Temperature (ºC)									
Humidity (%)	**26**	**28**	**30**	**32**	**34**	**36**	**38**	**40**	**42**	**44**
0	25	27	28	30	32	33	35	36	37	38
10	25	27	28	30	32	33	35	37	39	41
20	26	27	28	30	32	34	37	39	42	46
30	26	27	29	31	33	36	39	43	47	52
40	26	28	30	32	35	39	43	48	54	60
50	27	28	31	34	38	43	49	55	62	
60	27	29	33	37	42	48	55	62		
70	27	31	35	40	47	54	63			
80	28	32	38	44	52	61				
90	28	34	41	49	58					
100	28	36	44	56						

But it has happened before.

A study by Coates (1996) of natural hazard fatalities since the early 1800's showed that in the period 1803-1992 a total of 4,287 heat-related fatalities were recorded. This is higher than those attributed to any other natural hazard (see Figure 4).

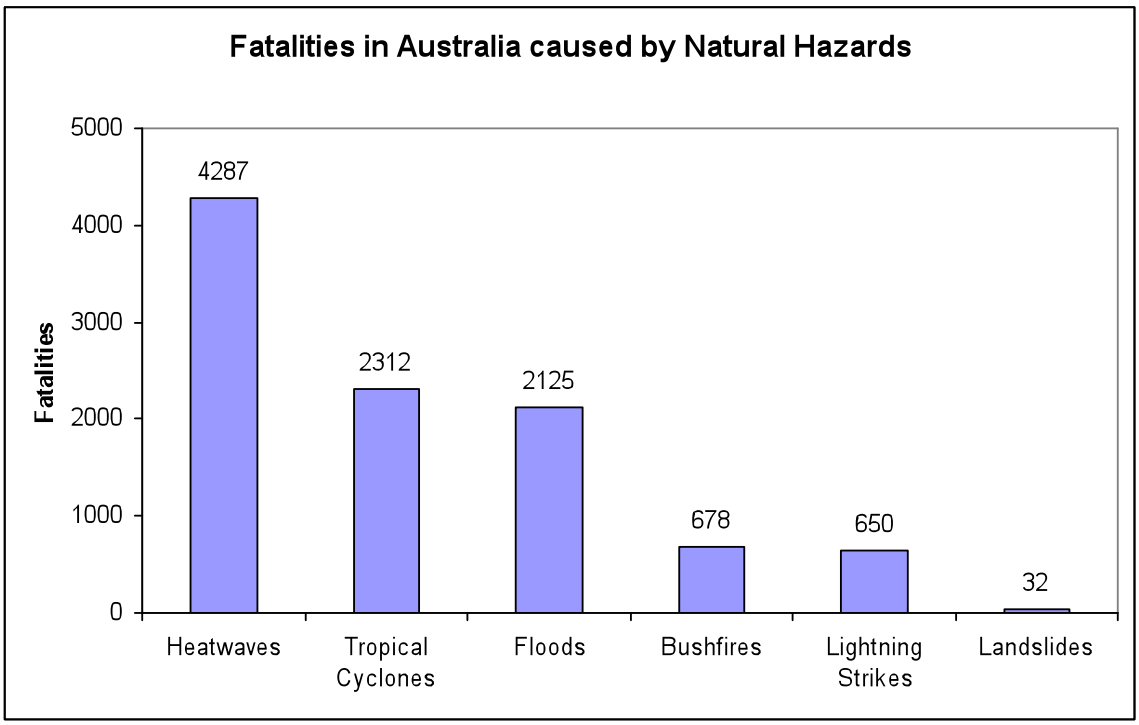


Figure 4 – Fatalities in Australia caused by Natural Hazards (Source: Coates 1996)

There have been many significant heatwave events in the past with devastating consequences (see Table 2). In 1939 a heatwave in southern Australia caused 438 deaths and seriously affected many thousands.

Year	Fatalities
1938-39	438
1895-96	437
1907-08	246
1920-21	147
1911-12	143
1926-27	130
1913-14	122
1939-40	112
1909-10	109
1972-73	99
1959-60	98
Total	**2081**

Table 2 – Significant heatwave events (Source: Coates 1996)

More recently, February 2009 saw south eastern Australia, and in particular Melbourne and Adelaide, reach very high maximums with little relief, with extremely high night time minimums. In Melbourne there were 374 excess deaths (deaths above what would be expected for the period of the event) and in Adelaide estimates ranged from 50 to 150, with more than 3,000 reports of heat-related illnesses (NCCARF 2010).

While it may appear that the risk has declined with time these recent events remind us that we must remain mindful and to not underestimate this silent killer.

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