

# future risk

The increased risk  
of catastrophic bushfires  
due to climate change



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*A firefighter checks the containment line near the town of Dederang, Victorian Bushfires 2009 ©AAP Image/Torsten Blackwood*



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## Increased risk due to **climate change**



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"Australia depends on thousands of paid and voluntary firefighters to keep us protected from bushfires each year. We are proud to serve the community in this way but, for the safety of Australian lives and property, recommend that every step be taken to minimise the risk of bushfires.

Bushfire conditions are clearly changing and there is strong evidence that global warming is making Australia's climate more bushfire-prone. Seasons are getting longer and fires are becoming more frequent and intense.

This report gives us a glimpse into the future and shows that the current lack of national and global action on climate change is set to dramatically raise Australia's bushfire risk. After a number of devastating bushfires in recent years, it makes more sense than ever to minimise the climate change-related increases in bushfire risk.

We must act in the interests of both the community, and of those who protect community. Firefighters are the first line of defence against bushfires, and are consequently those most at risk of injury from increased bushfire activity. Our job is already a dangerous one, and the trend towards more intense and longer duration bushfires increases those dangers.

Governments must heed the dangers identified in this important report and follow the recommendations it sets out for reducing greenhouse gas emissions."



*Jim Casey*  
State Secretary, New South Wales  
Fire Brigade Employees Union



**Fire has always played an important role in shaping Australia's environment. However, failure to address climate change is dramatically increasing bushfire risk across much of the country, making this familiar phenomenon one of Australia's most dangerous climate impacts.**

This report describes how climate change is exacerbating bushfire danger and what current global action on climate change means for future bushfire risk.

## A recipe for disaster

Although bushfires can be triggered in a number of ways, the underlying factors that create fire danger are:

- temperature
- rainfall
- wind speed
- condition of the fire "fuel"

These are the factors used to calculate the Fire Danger Index (FDI)<sup>1</sup>, indicating the daily fire danger and used to provide appropriate warnings to the community.

Many of the factors that contribute to the FDI are being exacerbated by climate change, increasing the average fire danger and the likelihood of major bushfire events.

Australia has warmed by 0.9°C since 1950, the strongest warming being in eastern Australia, where annual average rainfall is also declining by up to 50 mm per decade.<sup>2</sup> Hotter, drier weather is a recipe for bushfire disaster in regions of Australia home to the majority of the population. The bushfire season is becoming noticeably longer<sup>3</sup> and one major study has measured an increase in the Forest Fire Danger Index of 10-40% throughout southeastern Australia in the past twenty years.<sup>4</sup>

## Black Saturday – a major turning point

On 7 February 2009, the FDI was off the chart throughout Victoria. After a record three consecutive days over 43°C, Melbourne reached its highest ever recorded temperature of 46.4°C, while hot northerly winds blew up to 100 km/h ahead of a cold front.<sup>5</sup>

The Black Saturday bushfires were devastating, destroying the towns of Kinglake and Marysville as nearly half a million hectares were burned. Over 400 people were injured and 173 lost their lives.<sup>6</sup>



Location of bushfires in Victoria up to 23 February 2009. Source: 2009 Victorian Bushfires Royal Commission Interim Report, pg 13.



Aftermath of the Victorian Bushfires, February 2009. ©Greenpeace/Sewell

1. Australia uses both the Forest Fire Danger Index for forest country and Grassland Fire Danger Index for grassland and pastoral areas. For more detail on the factors making up fire danger indices, visit [www.csiro.au/resources/Fire-Danger-Fact-Sheet.html#1](http://www.csiro.au/resources/Fire-Danger-Fact-Sheet.html#1)

2. Climate Change in Australia: observed changes and projections, Australian Government Department of Climate Change. [http://www.climatechangeinaustralia.gov.au/documents/resources/Summary\\_brochure.pdf](http://www.climatechangeinaustralia.gov.au/documents/resources/Summary_brochure.pdf)

3. Lucas, C., Climate change impacts on fire weather, 2009, Centre for Australian Weather and Climate Research. [http://www.cawcr.gov.au/events/modelling\\_workshops/workshop\\_2009/papers/LUCAS.pdf](http://www.cawcr.gov.au/events/modelling_workshops/workshop_2009/papers/LUCAS.pdf)

4. Bureau of Meteorology Bushfire Cooperative Research Centre and CSIRO, Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts, 2007. <http://www.climateinstitute.org.au/images/stories/bushfire/fullreport.pdf>

5. <http://www.royalcommission.vic.gov.au/Interim-Reports/Interim-Report/Chapters/The-February-2009-Fires>

6. <http://www.theaustralian.com.au/news/victoria-bushfires-death-toll-revised-to-173/story-e6frg6n6-1225692862582>

The response to Black Saturday made it clear that the way Australians relate to bushfires has shifted, with a heightened awareness of the role of climate change in making bushfires more of a threat. As Peter Marshall, National Secretary of the United Firefighters Union of Australia, said: “Never before in Australian history have we been confronted with such destruction at the hands of fire”, and he called on governments to “follow scientific advice and keep firefighters and the community safe by halving the country's greenhouse gas emissions by 2020.”<sup>7</sup>

The shift in how we relate to bushfire danger is also evident in the changes made to the fire danger rating system. Before Black Saturday, the rating system was based on FDI values between 0 and 50+ and calibrated so that the conditions of the 1939 Black Wednesday fires correspond to a FDI of 100. On 7 February 2009 the FDI is reported to have reached 189 at Kilmore,<sup>8</sup> nearly four times the value required to qualify as “severe”.

Quite simply, the rating system had become inadequate. Following a recommendation from the Royal Commission into the Black Saturday bushfires,<sup>9</sup> the fire danger rating was modified to include a new “Catastrophic” level of danger of 100+. The new Fire Danger Rating system is reproduced below<sup>10</sup>.

The new “Catastrophic” rating was put into action for the first time on 17 November 2009 as a grassfire broke out near Port Augusta on a 45°C day, when the FDI was 161.<sup>11</sup> Since then, South Australia, Western Australia, Victoria and New South Wales have all issued warnings of catastrophic fire danger.

“Never before in Australian history have we been confronted with such destruction at the hands of fire.”  
(Governments should) ...“follow scientific advice and keep firefighters and the community safe by halving the country's greenhouse gas emissions by 2020.”<sup>7</sup>

*Peter Marshall,*  
National Secretary of the United Firefighters  
Union of Australia  
11 February 2009

## Projections of future bushfire danger in Australia

Future bushfire danger in Australia will depend heavily on how fast and by how much we act to tackle global warming. A study by the CSIRO and Bushfire Cooperative Research Centre (CRC) examined changes in bushfire danger based on the severity of global warming. The graph opposite shows that even under a low global warming scenario we can expect the number of days with an FDI of 50+ to increase. The worst-case scenario would result in up to a 300% increase of the number of days with an FDI of 50+ in 2050.<sup>12</sup>

Fire danger rating	Recommended action and potential fire behaviour
<b>CATASTROPHIC (FDI 100+)</b>	The safest option is for you and your family is to leave early, hours or the day before a fire occurs. Even well prepared and constructed homes will not be safe.
<b>EXTREME (FDI 75-99)</b>	Leaving early (hours before) will always be the safest option for you and your family. Staying and defending should only be considered if your home is well prepared, specifically designed and constructed for bush fire and you are currently capable of actively defending it.
<b>SEVERE (FDI 50-74)</b>	Leaving early will always be the safest option for you and your family. Staying and defending is only an option if your home is well prepared, and you are currently capable of actively defending it.
<b>VERY HIGH (FDI 25-49)</b>	Be prepared to implement your Bush Fire Survival Plan and keep informed of current fire activity by monitoring local media and regularly checking updates on the RFS website or information line.
<b>HIGH (FDI 12-24)</b>	Ensure that you, your family, your home and property is well prepared for the risk of bush fire.
<b>LOW-MODERATE (FDI 0-11)</b>	Review and rehearse your Bush Fire Survival Plan.

*Adapted from the Rural Fire Service Bushfire Survival Plan.*



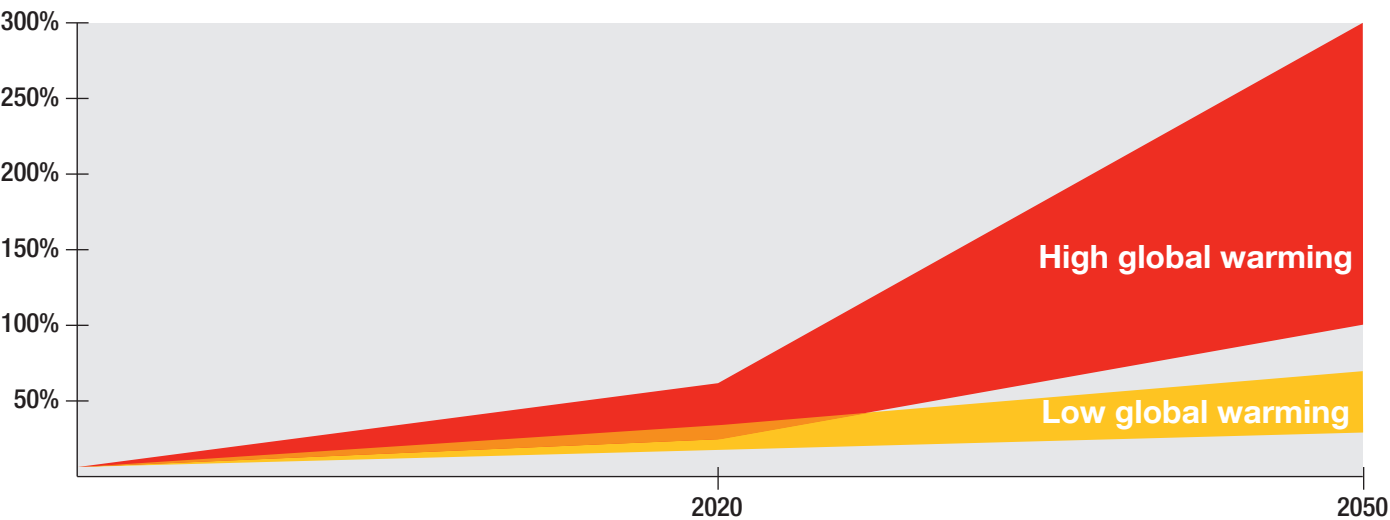


Australian flag upside down 'symbol of distress', Victorian Bushfires 2009 ©Greenpeace/Sewell

The best chance of avoiding a high global warming scenario is through a fair, ambitious and legally binding international treaty to cut emissions. Millions of people around the world demanded that world leaders deliver this treaty at the Copenhagen Climate Summit in

December 2009. However, the meeting failed to deliver any real progress and the resultant “Copenhagen Accord” is a meagre three-page document that contained no targets for cutting emissions and no legal mechanism to enforce any future targets.

### Percentage changes in the number of days with Fire Danger Index 50+ relative to 1990



Adapted from the CSIRO / Bushfire CRC report, *Bushfire Weather in Southeast Australia: recent trends and projected climate change impacts*.

7. The Age, 11 February 2009. <http://www.theage.com.au/opinion/face-global-warming-or-lives-will-be-at-risk-20090211-84od.html?page=-1>  
 8. <http://www.themonthly.com.au/nation-reviewed-john-van-tiggelen-comment-burning-bush-1475>  
 9. [http://www.dse.vic.gov.au/CA256F310024B628/0/5C144AB9ECF6ACE1CA257615001D4747/\\$File/Royal+Commission+Interim+Report+Executive+Summary.pdf](http://www.dse.vic.gov.au/CA256F310024B628/0/5C144AB9ECF6ACE1CA257615001D4747/$File/Royal+Commission+Interim+Report+Executive+Summary.pdf)  
 10. Adapted from [http://www.rfs.nsw.gov.au/file\\_system/attachments/Attachment\\_BushFireSurvivalPlan.pdf](http://www.rfs.nsw.gov.au/file_system/attachments/Attachment_BushFireSurvivalPlan.pdf)  
 11. <http://www.heraldsun.com.au/news/national/south-australia-issues-catastrophic-fire-warning/story-e6frf716-1225798802623>  
 12. The graph produced here has been adapted from the CSIRO / Bushfire CRC report, pg3, which was produced before the changes in the fire danger rating system, which means in their report “extreme” equates to an FDI 50+.



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**What does this mean for future bushfire danger in Australia? What we know about current international climate change action presents three scenarios to examine.**

### Scenario 1: Current pledges become the new global treaty

Heading into Copenhagen, many countries had nominated how much they were willing to reduce greenhouse gas emissions. If we assume that a new treaty is formed which turns the pledges currently on the table into binding commitments, the world would still be on track to warm by 3.5°C by the end of the century.<sup>13</sup> This is well beyond the 1.5°C limit of allowable temperature increase if we are to prevent climate change accelerating beyond our control.

For Australia, this means temperatures would increase by roughly 2°C above 1990 levels by 2050,<sup>14</sup> far in excess of the CSIRO / Bushfire CRC's "low global warming" scenario but somewhat lower than the "high global warming" scenario. This leaves us facing an approximate doubling of the number of severe (FDI of 50-74)<sup>15</sup> fire days in southeastern Australia by 2050. Specifically, we can expect that by 2050, severe fire danger would occur on average once every six months in Sydney and Adelaide, once every three months in Melbourne and in Bourke and Mildura, severe fire danger would occur for nearly two weeks of the year.<sup>16</sup>

### Scenario 2: No new treaty

As Copenhagen ended with no new treaty to reduce global greenhouse gas emissions beyond the Kyoto Protocol, we remain on the same trajectory of future warming as before Copenhagen. Just prior to the Copenhagen Climate Summit, the University of New South Wales produced an update of the Intergovernmental Panel on Climate Change (IPCC) science. It found that rates of greenhouse gas emissions were increasing at a greater rate than even the uppermost extremes of the IPCC's "business as usual" scenario.<sup>17</sup> The upper estimate of temperature increase in this scenario is 6.4°C globally by the end of the century<sup>18</sup> and, for Australia, a 2.8°C increase above 1990 levels by mid-century.<sup>19</sup>

Our current trajectory of emissions means the impacts on fire danger from the CSIRO / Bushfire CRC "high" global warming scenario should be treated as the minimum we can expect.<sup>20</sup> Therefore, by 2050, Australia is currently heading towards at least:

- The frequency of severe fire danger days more than tripling in Adelaide, Bendigo, Canberra, Nowra and Sydney.
- Around Melbourne Airport, catastrophic fire danger changing from being a one-in-33-year event to one in 3 by 2050.
- Mildura experiencing catastrophic fire danger more than once per season.
- By 2050, Canberra expecting nearly a quadrupling in the frequency of catastrophic bushfire danger.



## Achieving Scenario 3: **Hope**

It is essential to be prepared for the risk of bushfires by maintaining well rehearsed plans for the event of a fire, responding appropriately to warnings and acting to minimise the risk by removing unnecessary and dangerous sources of fire fuel near houses or other buildings.

However, by failing to treat the root causes of increased fire danger, we are knowingly placing more lives and property at risk. Both of the scenarios examined above are clearly inadequate responses to climate change and would result in an unacceptable level of increased bushfire risk. As Australian-based climate scientist Neville Nicholls describes, "We are unleashing hell on Australia".<sup>21</sup>

To have any chance of avoiding the worst impacts of climate change, it is essential that governments around the world commit to and meet strong targets for cutting greenhouse pollution. In Australia, this means halving emissions over the next decade. Political courage is essential to setting the strong targets needed to reach a new global climate treaty.

In the meantime, a lack of a strong treaty is no excuse for inaction. We already know what the sources of greenhouse pollution are and how to reduce them.

The single biggest cause of greenhouse pollution is burning coal for electricity.<sup>22</sup> Building a new coal-fired power station is the largest single addition we can make to our greenhouse pollution.<sup>23</sup> However, despite the severe risk created by greenhouse pollution and a range of alternatives to fossil fuels available today, coal-fired power stations continue to be built in Australia.

The first step in cutting emissions is to stop making the problem worse, prohibit the construction of any new coal-fired power stations, and turn instead to clean, renewable energy sources to meet our future energy needs. Modelling from the Canberra-based consultancy pitt&sherry shows that it is entirely possible to phase out coal-fired electricity in Australia by 2020, reducing emissions by about 180 million tonnes per year.<sup>24</sup>

By taking this action, we would make available a third scenario, one where the increases in fire danger are a fraction of what we are currently facing. By aiming for the low end of future global warming, the frequency of catastrophic fire danger in Melbourne would still increase by 2050, but by fifteen times less than under our current trajectory. Days of severe fire danger in Adelaide, Sydney and Canberra would increase by between 8-17%, compared with the more than 200% we are currently heading towards without a global treaty.

"We are unleashing hell on Australia."<sup>21</sup>

Neville Nicholls,  
Australian-based climate scientist



*The single biggest cause of greenhouse pollution is burning coal for electricity. Hazelwood Power Station Vic. ©Greenpeace/Hunt*

## **What people can do**

Australians can use their power as citizens, local community members and consumers to demand action to cut emissions.

To join our campaign and find out how to become an active part of the movement for a safe climate future, go to **[www.greenpeace.org.au/climate](http://www.greenpeace.org.au/climate)**

Greenpeace relies on the goodwill and generosity of individual members of the public. To donate to support Greenpeace's work, please visit [www.greenpeace.org.au/donate/](http://www.greenpeace.org.au/donate/) or phone 1800 815 151

## **Greenpeace**

Greenpeace exists because this fragile earth deserves a voice. It needs solutions. It needs change. It needs action.

Greenpeace is an independent campaigning organisation that uses non-violent direct action to expose global environmental problems and to force solutions which are essential to a green and peaceful future.

Greenpeace's goal is to ensure the ability of the earth to nurture life in all its diversity.

13. Based on analysis from Climate Analytics, Ecofys and the Potsdam Institute for Climate Impact Research, presented in [www.climateactiontracker.org](http://www.climateactiontracker.org). The 3.5°C figure is in relation to pre-industrial levels. 14. 3.5°C warming above pre-industrial levels by 2100 most closely corresponds with the IPCC A2 Scenario which results in a 3.4°C warming by 2100. According to the Department of Climate Change's Climate Change in Australia report ([http://www.climatechangeinaustralia.gov.au/documents/resources/TR\\_Web\\_Ch5i.pdf](http://www.climatechangeinaustralia.gov.au/documents/resources/TR_Web_Ch5i.pdf), p57) the IPCC's A2 scenario will result in warming of between 1.5°C and 2.5°C in south-eastern Australia.

15. The term "severe" is based on the recently amended bushfire danger rating system. In the CSIRO / Bushfire CRC report, this FDI level is classified as "extreme", as the report was produced prior to the fire danger rating system amendments.

16. The annual frequency of extreme fire danger days for the selected sites was calculated as follows: Adelaide, 2.4; Bendigo, 11; Melbourne AP, 4.3; Mildura, 12.1; Sydney, 2.15. A linear rate of increase in both temperature and fire danger in the CSIRO / Bushfire CRC report was assumed and the percentile value for fire danger that corresponded to a 2 degree increase (60th) was used.

17. [http://www.cccr.unsw.edu.au/Copenhagen/Copenhagen\\_Diagnosis\\_LOW.pdf](http://www.cccr.unsw.edu.au/Copenhagen/Copenhagen_Diagnosis_LOW.pdf)

18. Intergovernmental Panel on Climate Change Fourth Assessment Report, Working Group I, Summary for Policymakers. [http://www.ipcc.ch/publications\\_and\\_data/ar4/wg1/en/spmssp-projections-of.html](http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmssp-projections-of.html)

19. Climate change in Australia, Department of Climate Change, 2007. [http://www.climatechangeinaustralia.gov.au/documents/resources/TR\\_Web\\_FrontmatterExecSumm.pdf](http://www.climatechangeinaustralia.gov.au/documents/resources/TR_Web_FrontmatterExecSumm.pdf). The 2.8°C figure is again the upper estimate, chosen because this is the trajectory on which temperature change is tracking.

20. As The CSIRO / Bushfire CRC "high" global warming scenario was based 2.9°C warming beyond 1990 levels by 2050 and we are on track to exceed the 2.8°C high estimate of warming for Australia, we take the high global warming scenario to be the minimum level of warming in this study.

21. <http://blogs.abc.net.au/events/copenhagen/>

22. In 2008, coal combustion for electricity contributed approximately 180 million tonnes of Australia's total 597 million tonnes of greenhouse gas emissions. <http://www.climatechange.gov.au/en/climate-change/~media/publications/greenhouse-report/national-greenhouse-gas-inventory-pdf.ashx>

23. A power station such as Hazelwood in Victoria or Bayswater in New South Wales will emit close to 20 million tonnes of CO2 per year.

24. In press.



### **Tribute to James Gormley**

Greenpeace depends on the passion, vision and courage of our volunteers.

It is with great sadness that we mark the first anniversary of the passing of one such activist, James Gormley. James was one of 173 people tragically killed when bushfires swept through rural Victoria on 7 February 2009. He died together with his girlfriend, Julie.

For many years, James played a central role in our Melbourne volunteer group. James will be remembered for his ability to win people over with positive enthusiasm and entertaining stories. His deep commitment to environmental issues, in particular climate change, gave us all hope for a better future.

His passion, integrity and courage is deeply missed. We pay our respects to James and all those affected by the Black Saturday bushfires.



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