Risk Mitigation Consulting Inc.

Intelligence and Analysis Division

WHITE PAPER SERIES

Australian Bushfires: Impacts and Causes

INTENT

This white paper is designed to provide analysis of relevant, publicly available information on threat and hazard events/trends and their potential impacts to the interests of the United States, both at home and abroad. This product is not intended to be an all-encompassing assessment of the subject.

Australian Bushfires: Impacts and Causes

Introduction

Beginning in September of 2019, a massive number of wildfires have been burning across Australia. These wildfires, also referred to locally as bushfires, usually occur every summer. Lighting strikes and other natural causes are usually to blame for starting the fires. However, this fire season began amidst one of Australia's worst droughts in recent years as well as during the warmest year on record for Australia. An estimated 98% of Australians live along the coastal area, where a majority of the blazes are located. More than 1/3 of Australians have been impacted by the fires. While these fires are still expected to burn for months, it is important to understand the overlapping causes and potential ripple effects of such a disaster.

Current Status

The wildfires that have burned since September 2019 have burned more than 15 million acres of land. To compare, the California wildfires of 2018 burned around 2 million acres. Thousands of Australians and tourists have been evacuated. As of 6 January, almost 2,000 houses have been confirmed destroyed. At least 25 people have died since September. A recent report estimated that 480 million mammals have been killed since the start of the bush fire season in September. [1,2]

Aside from the direct destruction of the fire, impacts have been far reaching. Air quality and visibility has been significant reduced in cities far from any blaze. In December, the smoke in Sydney was so bad that air quality measured 11 times the "hazardous" level. Doctors have warned of increased respiratory dangers - especially to vulnerable people, including pregnant women. Melbourne is more than 100 miles away from the nearest fires, and much farther away from the worst blazes. However, in early January the city was blanketed in smoke, reducing visibility to 0.60 miles. Furthermore, ash has been raining from the sky throughout the country. Roads and flight paths are restricted, hindering firefighting and rescue efforts. The fires have also impacted power and data connections.[3,4]

Exacerbating Causes

While brushfires are a yearly occurrence in Australia, it is clear that the scale and destruction of these fires will be historical. It is impossible to point to a single factor as the cause of these extreme fires. It is the combination of public policy, forest clearing habits, high winds, drought, and extreme heat that must be examined to understand the destructive consequences of the season.

Extreme Heat

The past 10 years were the hottest decade on record globally. A United Nations climate report published in 2007 said heatwaves and fires were “virtually certain to increase in intensity and frequency” as global average temperatures increase. “An increase in fire danger is likely to be associated with a reduced interval between fires, increased fire intensity, a decrease in fire extinguishments and faster fire spread,” the 2007 report said. In Australia, temperatures passed

48.9 degrees Celsius (120 degrees Fahrenheit) in the first week of January. In December, the national high average surpassed the record for any continent on earth at any time of year, reached 41.9 degrees Celsius (107.4 degrees Fahrenheit). Several instances of record-breaking temperatures were recorded across the country in December.[5,7]

2019 was both the warmest year on record and the driest year ever measured in Australia. Warmer temperatures and extreme weather have made Australia more susceptible to fires and increased the length of the fire season. Southern Australia has seen rapid warming of around 1.5 degrees Celsius (2.7 degrees Fahrenheit) since 1950. Furthermore, once an area is in drought conditions for two months or more, it increases the risk of fires catching and spreading. Changing weather patterns due to global warming make drought events longer. It is generally agreed upon that climate change is increasing bushfire risk in Australia by lengthening the fire season, decreasing the overall precipitation and increasing temperature across the country. While climate change might not ignite the fires, it creates the potential to supercharge Australian wildfires. Drought increases the amount of fuel (dried vegetation) available and, due to more rapid evaporation, reduces water availability.[5,6]

Hazard Reduction

How land is managed can impact the amount of fuel available for fires. Sometimes referred to as "hazard reduction," the management of potential wildfire fuel is an important tool in potentially reducing the severity of seasonal blazes. This includes controlled burning and the removal of trees and vegetation. Last fire season, the National Parks and Wildlife service in New South Wales reported hazard reduction activity across 139,000 hectares. However, the ability to completely hazard reduction activities is highly weather dependent. Prolonged drought conditions adversely affect the ability of agencies to carry out hazard reduction. Rising temperatures have narrowed the window in which controlled burns can be utilized. Firefighters have also witnessed severe blazes reigniting areas that were previously burned. Furthermore, public policy changes impact the amount of hazard reduction carried out. For example, public policy that aims to preserve wildlife habitats may also create spaces containing massive amount of vegetation and fuel for fires. [8,6]

Weather Systems

Some of the largest fires are so hot and so large that they are creating their own weather patterns, potentially worsening conditions. These include fire tornados, fire-driven thunderstorms, fire clouds and so-called ember attacks.

Fire-driven thunderstorms typically occur when columns of smoke and heat draw in moisture from the atmosphere and create an enormous pyrocumulonimbus, or "fire cloud." These massive clouds form when a non-atmospheric source of heat, most commonly from wildfires or volcanic eruptions, create or enhance a local updraft. However, the clouds contain relatively little rain, making them tough to spot and gauge using aircraft radars. Abundant lightning, with the potential to start new fires, has been observed from these clouds in Australia. These formations can also spread fires by driving strong winds, generating lightning and lofting burning fragments — a phenomenon sometimes called an ember attack. Their presence is an indication that a fire is exhibiting extreme behavior. [9,10]

Fire clouds also funnel smoke and tiny particles known as aerosols into the lower stratosphere, similar to a volcanic eruption. A 2018 study found that the number of aerosols lofted into the atmosphere from fire clouds is equivalent to that of a moderate-size volcanic eruption. There is also a chance that fire clouds can produce severe weather. This includes flooding, muddy rain, hail and damaging downdraft winds. The rising air also can cause intense updrafts that suck in air at a rate to cause strong winds to develop. Sometimes those winds can create what's known as a "fire tornado," when winds created by an intense fire whirl and twist tightly. The hotter the fire, the faster the air rises and the tighter it twists, until it takes off as a tornado. [1,9,10]

Looking Forward

Despite millions of acres of destruction, the fires are unlikely to subsides any time soon. Summer temperatures in Australia typically peak in January and February. Additionally, the largest wildfires of the season typically break out in the time, so the country could have months of more fires. The fires that burn over the course of this season may also have impacts beyond the current known destruction. For example, a massive rainfall occurring in burnt areas has the potential to cause large-scale mudslide. Moderate and severe wildfires burn off all the surface litter and ground vegetation, leaving a layer of easily removed ash on top of otherwise bare soil. The eroded soil has the potential to mix with ash and rain, creating mudslides. As fires continue to burn, the country remains alert for further disasters, such as a currently developing tropical cyclone. [11]

Conclusion

Wildfires occurs every year in Australia, due to natural and man-made causes. However, the fires this year occurred among a combination of unique events. Examining some of the root causes and effects of the Australian wildfires helps in gaining a broader understanding as to the severity of these fires. Most notably, years of rising heat has led to extreme drought, shorter periods for hazard reduction, a decrease in moisture, and an increase in the amount of wildfire fuel. Weather patterns from pre-existing large fires will also present challenges in controlling the blazes. The massive scale of destruction is only beginning to be understood and will no doubt impact the economic and ecological landscape in the coming months and years. Understanding the impact of climate change and public policy can provide valuable lessons for regions facing similar circumstances.

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