



Adverse Impact of Forest Fires: Biodiversity Disaster in Australia

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ABSTRACT

Months after the devastating fire in the Amazon, the largest terrestrial carbon dioxide sink, that burned about 9000 km² area, the world is witnessing another such tragedy in Australia in the form of bushfires. Although these kinds of fires are very common in both the forest areas and occur every year, the alarming rate of their increase and high intensity has been the matter of major concern. Both these incidents have drawn attention of climate activists and political leaders at the local and international level. This document is the case study of the bush fires in Australia, something that has been caused by humans and is affecting the whole environment.

KEYWORDS: Bush fire, black carbon, Biodiversity loss and economic loss, Indian Ocean Dipole and Pyro-cumulonimbus clouds.

1. INTRODUCTION

Bushfires are a common and natural phenomenon which play a vital role in the atmospheric and terrestrial system [1]. Globally on average, an approximate area of 350 Mha is burnt annually [2]. Several mega bushfire events in Australia have been documented such as Gippsland fires and Black Sunday (1926), Black Friday (1939), Australian Bushfire Season (1974–1975), Waterfall bushfire (1980), Canberra bushfires (2003), and Black Saturday (2009) [3].

Australia is in the grip of deadly wildfires burning across the country, triggering an emotive debate about the impact of climate change in the world's driest-inhabited continent. However, the recent

bushfire season (2019–2020) in Australia, centered in the south eastern part of the country (New South Wales, NSW), has turned out to be the most catastrophic (in terms of burnt area and severity) in the continent's history since the European settlement and colloquially also known as the Black Summer. Sanderson and Fisher (2020) [4] commented that the 2019–2020 Australian bushfire is an indication of the future that is quickly becoming present and this is solely due to climate change. The unprecedented scale of the crisis, and images of terrified tourists sheltering on beaches from the infernos, has shocked many Australians. With summer only just beginning and the nation affected by a prolonged drought,

authorities fear the death toll will continue to mount as more homes and land are destroyed^[5]. It's a matter of grave concern as the area burnt is roughly equal to 3.25% of India's area⁵ and all this when the estimates say that it would be months before this razing blaze cools down. The significance of the fires in Australia that has occurred this year is that some of the resultant phenomena are very rare or haven't occurred before. This fire is an event from which the actual face of furious nature is seen and this has given the scope to understand, evaluate and recover the damages caused.

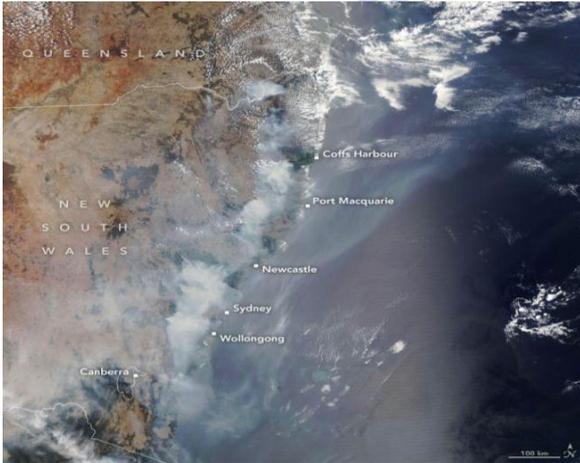


Fig.1 Australian bush fires on the south-eastern coast (Image captured by NASA satellite.)^[6]

A series of bushfires started in East coast of Australia in the bush fire season of 2019-20. Regarded as the worst bushfire in human history, these fires, also known as wildfires, have emerged as a great danger to the existence of a nation and its scenic natural environment that houses several endemic species that are at the verge of extinction. In the month of August, several bushfires were reported, just like every year at around same time. By November, the fires picked up pace and continued to spread in three directions with the East coast being the worst affected.

2. REASON BEHIND FOREST FIRE

The first response to the question would be “we-the humans” whose several greedy efforts to earn a profit out of everything has caused this mishap. But of course, several other factors combined with human errors are also to blame. Existing studies have indicated that the primary cause of flame occurrence is the combination of three main components: hot weather, fuel availability, and an ignition source^[7]. The depleted ozone layer over

the Australian continent that in turn increases the temperatures led to the mercury reaching the record-breaking mark. This increase in temperature has already influenced the water cycle by intensifying the localized precipitation at some regions^[8] and simultaneously aggravating the drought intensity and frequency at other locations^[9-10]. Combined to this was the prolonged drought season in the area of the fires. Australia has seen a constant increase in the temperature over the last decade and in 2019, it has recorded the highest temperatures in various areas due pollution. Notably, most of such areas stand engulfed in the bush fires now.

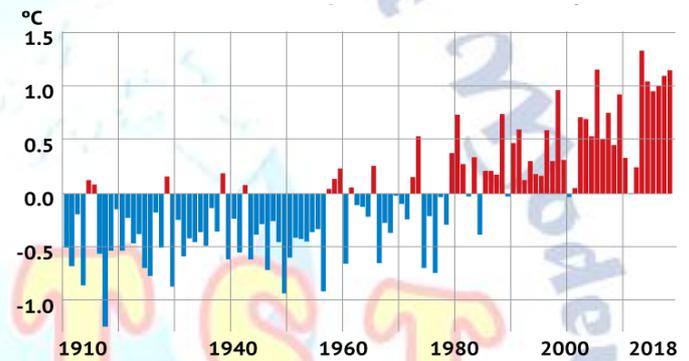


Fig.2- Constant increase in temp. (Ref: Bureau of Meteorology, Australia cited at Sydney Morning Herald)

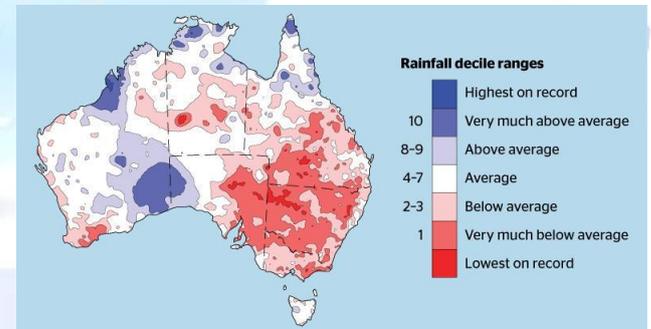


Fig.3-Map showing Australia's rainfall in 2018 (Ref: Bureau of Meteorology, Australia cited at Sydney Morning Herald)

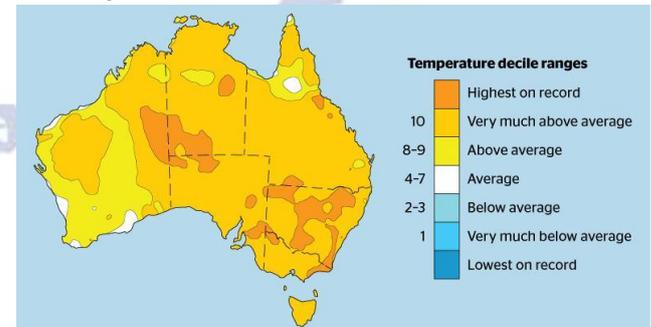


Fig.4-Map of maximum temperatures in Australia in 2018. (Ref: Bureau of Meteorology, Australia cited at Sydney Morning Herald)

A handful of studies have focused on the effect of slope on fire propagation^[11-13] and fuel moisture content^[14]. Also, past research studies have illustrated that some of the major historical bushfire events in the Southeast Australian region have proliferated due to extreme heat waves^[15]. Similarly, in a commentary by King et al. (2020)^[16], the wide extent of the bushfires is claimed due to extremely dry conditions that persisted over the past 2 years. These dry conditions were further linked to negative Indian Ocean Dipole (IOD) and absence of La Niña. Furthermore, Nolan et al. (2020)^[17] explained in a Letter that dry fuel moisture and the ongoing droughts are the only causes of the 2019–2020 Australian bushfires.

The increase in temperature and simultaneous decrease in rainfall is caused by another natural phenomenon called the Indian Ocean Dipole (IOD). The IOD is currently positive which means the sea surfaces on the western part of the ocean are warmer and result in rainfalls higher than the average. On the contrary part, Australia, which is on eastern will receive lower-than-average rainfall with increase in temperatures. This effect presently the strongest in the past 60 years and this did its part in igniting the flames. Similarly, major droughts create favourable conditions for bushfires in forested ecosystems (Bradstock et al., 2014)^[18]. In addition, natural climatic variability has been linked to seasonal-decadal long droughts in various regions (Frootan et al., 2019; Kiem & Franks, 2004)^[19-20]. Furthermore, sea surface temperature alterations are also claimed to have strong associations with regional droughts (Harrison et al., 2019; Wu & Kinter, 2009)^[21,22] which further governs the spread of bushfires (Russo et al., 2017)^[23].

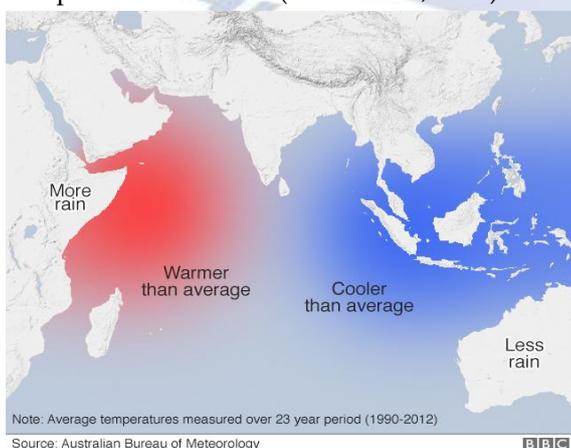


Fig.5- Map showing the effect of Indian Ocean Dipole^[24].

Furthermore, Nolan et al. (2020)^[25] explained in a Letter that dry fuel moisture and the ongoing droughts are the only causes of the 2019–2020 Australian bushfires. One more interesting factor here that added fuel to the ignited fire was the presence of eucalyptus forests. These have grown as invasive species in the forests of Australia and are feeding the fire with flammable material. Fallen eucalyptus leaves create dense carpets of flammable material, and the trees' bark peels off in long streamers that drop to the ground, providing additional fuel that draws ground fires up into the leaves, creating massive, fast-spreading "crown fires" in the upper story of eucalyptus forests. Additionally, the eucalyptus oil is flammable oil: This oil, combined with leaf litter and peeling bark during periods of dry, windy weather, can turn a small ground fire into a terrifying, explosive firestorm in a matter of minutes.^[26] Over this are the obvious acts of humans that contributed directly or indirectly to the mishap. Australia is the largest exporter of fossil fuels. Coal and natural gas, valued at \$46 billion are Australia's most valuable exports. And due to this fact, Australian government kept on promoting their mining industries against the Paris agreement where several countries (including Australia) pledged to reduce their carbon emissions. But in turn, the politicians have undone some of the few policies in place to fight climate change. Over this, in 2014, Australia repealed the carbon tax to ease the businesses related to fossil fuels and mining.^[27] To avoid such incidence, we should more focus on Greensynthesis^[28-29] of to avoid pollution of environment

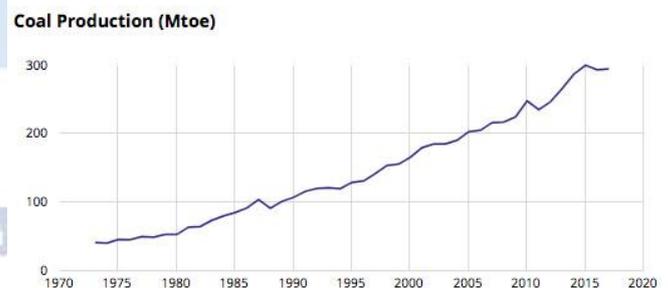


Fig.6-Graph showing Coal production in Australia (in Millions of tons) (Ref: International Energy Agency)

On the other hand, several unofficial reports claim that the Australian PM Scott Morrison rejected the help offered by neighbor nations and was on a holiday trip in Hawaii while his own country was down with

flames. The same reports also stated the government denied the help offered by Navy to evacuate the people and tourists from the coastal towns.

3. ADVERSE IMPACT OF FIRE

A bush fire that turned around 10 million hectares of forests into ash thereby killing 1,25 billion animals. The fire has also claimed the lives of 28 people^[30] including 4 fire fighters and has destroyed 3000 houses ^[31-33]. This fire put 250 million tonnes of carbon dioxide into the atmosphere thereby creating an international threat. ^[34] Although Forest re-growth can reabsorb emissions from fires but scientists fear natural carbon 'sinks' have been compromised. As mentioned earlier, the fire is spreading in three directions and there is a high chance that these could combine to form a 'mega blaze' which would snatch the whole situation out of our hands. Also, this would mean an increased chance of this fire spreading to neighbouring countries. While fire is a problem, smoke is another. The smoke emerging out of this fire is choking the major cities of Australia including the capital, Sydney. Over that, it has already travelled around 2000 kilometers to New Zealand where it possesses the next threat.

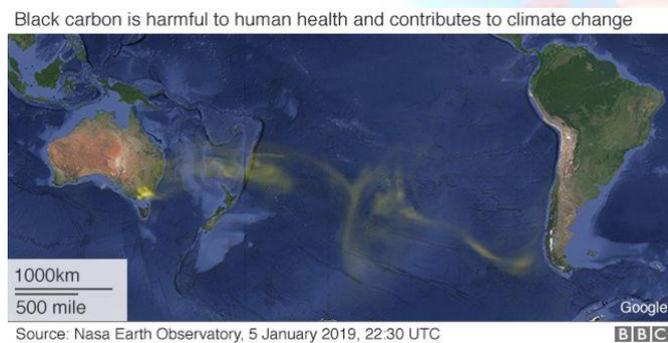


Fig.7-Earth map showing carbon vapours formed from the bush fires^[35]

Another associated phenomenon is the Pyro-Cumulonimbus Clouds. The intense smoke from the bush fire leads to their formation and these clouds can create dangerous and unpredictable changes in the fire behavior. These create thunderstorms and spread fires through lightning and generation of severe wind outflows. These clouds make rescue missions difficult because the fire pattern is unpredictable and also surround a place from either side leaving no route to escape.

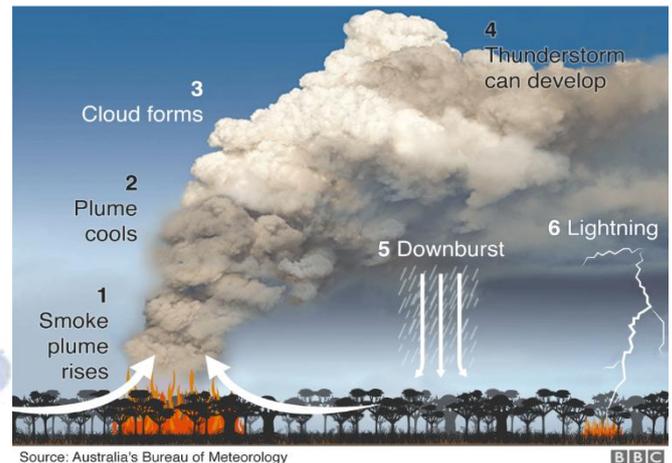


Fig.8-Picture showing the formation of Pyro-cumulonimbus clouds and the way it spreads fires at a far-off location^[36].

Tears rolled in eyes of each human being when pictures of Koalas with burnt fur and paws and Kangaroo's carcasses charred surfaced on the social media. The fire reportedly killed about half a billion animals including kangaroos, camels and other small creatures and reptiles that have significant role in the ecosystem, said the ecologists from the University of Sydney. The death of around 30% of the species of the iconic animal of Australia, Koala. They contributed a lot to the tourism. When Koalas sense danger, they climb up trees and wait. But unfortunately, they are engulfed by the fire and this caused substantial increase in the number of these endemic species. The actual number of animals that were affected by the fire is much larger. The smoke from the fires chokes the animals in nearby forests and some animals also die because of loss of habitat and lack of food while some because of becoming prey to others. Only few animals that escaped the fire or that were rescued by the officials and locals survived. The fire now threatens Australia with possible local extinctions. Even their "insurance population", which consists of infection-free koalas that hold the key to the species' future, are feared to be dead. ^[37,38]

4. GOVERNMENT ROLE IN CONTROLLING BUSH FIRES OF AUSTRALIA

The Government of Australia paid a deaf ear to the mother nature calls for help in the initial months and tremendous firefighting efforts also were of no use at a later time. The Government had to deploy military and recruit volunteers for the firefighting missions. The

Government of Australia and PM Scott Morrison faced a lot of criticism from the people for delayed and inefficient steps taken to tackle the problem. In fact, the government was unwilling to compensate the volunteers who risked their lives and worked overtime along with the officials. It is still a wonder that the Prime Minister still keeps his stand in supporting the mining activities and believes that the country is making progress in controlling carbon emissions even after facing criticism at world conferences. The people are dissatisfied to the level that they refused to shake hands with the Prime Minister who paid a visit to the fire hit towns^[39]. The government has deployed huge number of firefighting personnel along with helicopters and necessary aid. But all this put together are not enough to battle the fire with blazes as high as the Qutub Minar.

5. LATEST UPDATE AND CONCLUSION

By the evening of Monday, the 14th January, 2020, news of containing the mega blaze of Australia up to some extent came from the New South Wales Rural Fire Service commissioner, as reported by NDTV. The commissioner mentioned that they were successful in getting an upper hand in the fire that has been burning for the past three months as the wet weather promised to deliver the must needed respite for countryside. Although dozens of areas are yet to be extinguished, they are hopeful of the forecasted rains of 50 millimeters in the next week, the report added.^[40]

The apocalyptic skies of Australia have turned blazing red due to the fire forcing the panic stricken public to vacate their houses and seek shelter elsewhere.



Fig.9- Picture showing the red skies of Australia^[41]

This isn't over when the fire goes out. The people on the front line, the ones who have lost their loved ones or their homes along with the fire personnel undergo post-traumatic stress and depression. They might take months to forget and recover. For this cause, the Australian government has launched free counselling sessions for people effected to help them and prevent suicides.^[42] On the other side of the coin is the mother nature. It would be decades before everything can be brought to normalcy and this would also require both significant interest and investment.

Bloomberg Quint reports: "An increase in fire danger in Australia is likely to be associated with a reduced interval between fires, increased fire intensity, a decrease in fire extinguishments and faster fire spread. In south-east Australia, the frequency of very high and extreme fire danger days is likely to rise 4-25% by 2020", read a major global report by an UN committee in the year 2007^[43]. This fire has been a tough lesson. It brought people close with many offering to help voluntarily. The first in the list are the fire-fighters who let off their regular jobs to take part in rescue missions just because it's their passion and they considered it brotherhood. Comments expressing sympathies and offers to help poured down through official channels and social media from various governments and celebrities across the world. The words of Prime Minister of Papua New Guinea "1000 troops stand ready to be deployed at the call for help from Australia"^[44] shows that humanity is still within us and awakens with the need. Taking it a little further, we must in the same collective spirit try to act upon the warnings that we give to ourselves and try to coexist with the supreme nature. We get Green revolution via sustainable use of green Biofuel^[45-47].

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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