

**Committee:** SPECON

**Topic:** Ameliorating biodiversity in Australia after the 2019 wildfires

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**Position:** Deputy President

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## Personal Introduction

Dear delegates,

My name is Lydia Stylidi, I am 16 years old and I am currently in Grade 11 at the Senior High School of Anavryta. This year I am honoured to be serving as Deputy President of the Special Conference at CSMUN. My experience in MUN has taught me not only to speak up, but also showed me how to advocate for views that did not always coincide with mine, a versatility and adaptability which is very important in our everyday lives. Many people, including myself, consider it a life-changing experience. I highly encourage all of you not to be afraid, but instead well-prepared to be able to contribute towards a fruitful debate in our committee.

This study guide is designed to ameliorate your understanding of the issue while providing you with some basic but vital information on the topic. However, you should not solely rely on it but instead conduct further research on the topic. I would be more than glad to assist you if you come across any problems throughout your preparation. Please feel free to contact me : [lydiastylidi@gmail.com](mailto:lydiastylidi@gmail.com)

Looking forward to meeting you all in October!

Yours truly,

Lydia Stylidi



## Topic Introduction

Many provinces of Australia constitute remarkable biodiversity hotspots, rendering the country popular among the global community, with Australia's biodiversity simultaneously being an attractive spectacle but also a hotspot vulnerable to natural disasters such as wildfires.

The ignition of the 2019 bushfires mainly affected the areas of Victoria and New South Wales in South Australia, where many forest areas, national parks, alpine areas and other delicate ecosystems were damaged by the fire, resulting in a terrible loss of fauna, flora and of the overall ecosystem. This had a direct impact not only on the flora and fauna gravely affected during the wildfires, but also affected other species which were not initially harmed by the fires, but suffered afterwards due to vegetation and food source loss, but also habitat devastation.

However, the breakout of such wildfires is not an unprecedented situation for this country. Australia has faced devastating fire regimes, such as the Black Friday and Ash Wednesday fires, but most notably, the Black Saturday fires, which, to this day, remain the most destructive in the country's history. Due to other natural disasters, the impact of climate change on ecosystems, industrial growth and other factors, Australia's natural landscapes have begun a reconfiguration process, with many rural areas sadly turning to fire-prone environments.

This exigent situation has «touched» many states, with countries such as the United States, the United Kingdom, France but also neighboring countries with a stronger solidarity sentiment like Vanuatu and New Zealand offering significant assistance either financially, or by providing Australia with additional military and firefighting personnel, as will be shown later in further detail.

In conclusion, to deal with such disasters, adequate measures and proper fire management must be implemented to conserve biodiversity as well as to prevent future fires from inflicting such terrible losses on a social, economical and environmental level, as was sadly the case with the wildfires of 2019.



## Definition of key terms

### Amelioration

The process of improving a bad or unpleasant situation <sup>1</sup>  
e.g. the amelioration of biodiversity regarding the topic at hand means not only recovering from the damage caused by the wildfires and trying to make up for the losses in fauna and flora, but also improving the conservation of biodiversity in Australia.

### Wildfire

An uncontrolled conflagration in a wilderness (e.g. forest, brushland) or a rural area <sup>2 3</sup> which can have devastating results on the biodiversity of an area and the habitat preserving it, because of the morphology of the territory where it breaks out. The magnitude of this effect depends on the weather conditions, speed of wind, soil quality, the response of the firefighting agency e.t.c.

### Bushfire

A wildfire subspecies which burns in the bush. It is very common in Australia and despite the fact that it expands at a slow pace, it produces a huge amount of heat and proves quite resistant. A bushfire's fierceness and rate of expansion greatly depends on temperature, wind speed, humidity, fuel cargo as well as the slope angle of the area where the fire is burning. <sup>4 5 6</sup>

<sup>1</sup> "AMELIORATION | meaning in the Cambridge English Dictionary."

<https://dictionary.cambridge.org/dictionary/english/amelioration>.

<sup>2</sup> "wildfire | Definition & Facts | Britannica." <https://www.britannica.com/science/wildfire>.

<sup>3</sup> "Wildfire | Definition of Wildfire by Merriam-Webster." <https://www.merriam-webster.com/dictionary/wildfire>.

<sup>4</sup> "Bushfire - ScienceDaily." <https://www.sciencedaily.com/terms/bushfire.htm>.

<sup>5</sup> "Bushfire | Geoscience Australia." <https://www.ga.gov.au/scientific-topics/community-safety/bushfire>.

<sup>6</sup> "BUSHFIRE | meaning in the Cambridge English Dictionary." July 8, 2020, <https://dictionary.cambridge.org/dictionary/english/bushfire>.



## Flora

The plants in a particular geographical region or ecosystem in a period of time.<sup>7</sup> Flora are responsible for the formation of natural habitats, the provision of vegetation as well as of oxygen. They are vital for the preservation of life and medicinal elements. In case of bushfires, a great part of flora species become susceptible to fire.

## Fauna

The entirety of animal life in a particular region or time period.<sup>8</sup> Fauna benefits ecosystems as they act in a symbiotic way with flora. Fauna produces carbon dioxide, which is a reactant in the process of photosynthesis. More specifically, carbon dioxide after being exhaled from the fauna (and humans) is absorbed by the plants through pores called stomata. Then, flora begins the photosynthesis process, the process through which plants feed themselves.<sup>9</sup> Fauna also provides humans and other species with food, while its waste products improve soil quality in the form of manure, and aid in the reproduction of microorganisms, e.t.c.

## Biodiversity

The existence of a variety of living species, meaning flora and fauna (as well as bacteria and fungi), which contribute to a balanced ecosystem.<sup>10 11</sup>

The conservation of biodiversity is vital for the proper functioning of an ecosystem and the preservation of a balanced food chain, free of disruptions, which would hinder certain species' ability to survive due to them being unable to consume the food they need. Such a phenomenon drastically alters

<sup>7</sup> "flora noun - Oxford Learner's Dictionaries."

[https://www.oxfordlearnersdictionaries.com/definition/american\\_english/flora](https://www.oxfordlearnersdictionaries.com/definition/american_english/flora).

<sup>8</sup> "Fauna: Definition, History and Examples | Biology Dictionary." May 20, 2018,

<https://biologydictionary.net/fauna/>.

<sup>9</sup> "What Happens to Carbon Dioxide During Photosynthesis?." <https://sciencing.com/happens-carbon-dioxide-during-photosynthesis-8527975.html>. Πρόσβαση στις 6 Αυγ. 2020.

<sup>10</sup> "Biodiversity | National Geographic Society." August 8, 2019,

<https://www.nationalgeographic.org/encyclopedia/biodiversity/>.

<sup>11</sup> "biodiversity noun - Definition, pictures, pronunciation and ...."

<https://www.oxfordlearnersdictionaries.com/definition/english/biodiversity>.



the population of certain species, given that predator-prey relationships are symbiotic.

### Biodiversity hotspots

A biogeographic region which is characterized by a high biodiversity level, and is facing a conservation crisis due to high levels of plant endemism (over 1,500 vascular plants) and native vegetation loss (of over 70 percent) <sup>12 13</sup>

### Indian Ocean Dipole (IOD)

A weather phenomenon at the Indian Ocean which acts as a climate driver for Africa and Australia. It varies between three phases: negative, neutral and positive. When a positive IOD phase is in effect, due to the presence of cooler waters and less clouds forming, less rain appears in central and southeastern areas. As a result, high temperatures emerge and contribute to an increased risk of bushfires in these regions. Last positive phase: 2019 <sup>14</sup>

### Southern Annular Mode (SAM)

SAM is a weather phenomenon at the Subtropical Ridge which acts as a secondary climate driver for East Australia. Like the IOD, it has negative, neutral and positive phases. When a negative SAM phase is in effect in winter, Westerly winds head to Antarctica and hot air and dry conditions head to Eastern Australia. Last negative phase: 2019 <sup>15</sup>

<sup>12</sup> "Biodiversity Hotspots | National Geographic Society." April 19, 2019, <https://www.nationalgeographic.org/encyclopedia/biodiversity-hotspots/>.

<sup>13</sup> "Biodiversity hotspots defined | CEPF." <https://www.cepf.net/our-work/biodiversity-hotspots/hotspots-defined>.

<sup>14</sup> "Positive Indian Ocean Dipole fuels bushfires devastating ...." December 11, 2019, <https://www.abc.net.au/news/2019-12-11/indian-ocean-dipole-fuels-dry-australia-bushfires-africa-rain/11787874>.

<sup>15</sup> "Positive Indian Ocean Dipole fuels bushfires devastating ...." December 11, 2019, <https://www.abc.net.au/news/2019-12-11/indian-ocean-dipole-fuels-dry-australia-bushfires-africa-rain/11787874>.



### Dry lightning

A cloud-to-ground lightning without the presence of rainfall nearby, which carries great potential to trigger a wildfire. <sup>16</sup>

### “Pyrocumulonimbus” clouds

These clouds are the evolutionary form of “pyrocumulus” clouds, which are created due to intense heat phenomena on the surface, such as wildfire. Water vapor converts them to “pyrocumulonimbus” clouds, which are similar to thunderclouds. They can produce lightning and create a new firespot. <sup>17</sup>

### Pollinator

An animal, most commonly an insect or occasionally an avian or mammal, which transports pollen grains. These act as genetic material for the flora, which fertilizes them, resulting in the creation of new seeds, the stabilization of soil and the purification of air, amongst other phenomena. <sup>18 19</sup>

### Defence personnel

Personnel which is employed by the Department of Defence, or for organizations closely related with Defence or acting as a member of the Australian Defence Force (ADF). Defence personnel include members of the army, navy, etc. <sup>20</sup>

<sup>16</sup> "Dry Lightning - WFAS." <https://www.wfas.net/index.php/dry-lightning-experimental-products-97>.

<sup>17</sup> "What are pyrocumulus clouds? | The Weather Guys." June 11, 2012, <https://wxguys.ssec.wisc.edu/2012/06/11/what-are-pyrocumulus-clouds/>.

<sup>18</sup> "About Pollinators | Pollinator.org." <https://www.pollinator.org/pollinators>.

<sup>19</sup> "What are pollinators and why do we need them? — Center for ...." <https://ento.psu.edu/pollinators/resources-and-outreach/what-are-pollinators-and-why-do-we-need-them>.

<sup>20</sup> "Defence Personnel | legal definition of Defence ... - Law Insider." <https://www.lawinsider.com/dictionary/defence-personnel>.



## Background Information

### Earlier fire breakouts in Australian history

Wildfires, particularly bushfires, have become part of the Australian ecosystem for a long time now. The 2019 wildfires weren't the worst Australia has faced, given that more deaths and overall damage has been recorded during the following disasters:

1. "Black Saturday" bushfires in 2009:

The sudden fatal breakout of fire in the state of Victoria was a result of the terrible weather conditions the days before and after the breakout. A heatwave hit Victoria, particularly Melbourne, which experienced temperatures of 43C three days consecutively. However, on Saturday, 7th February, not only did Melbourne reach temperatures of 46C, but the severe, long-term drought, low humidity levels and altitude of the wind, whose speed was around 100 km/h all contributed to the «ideal» conditions existing for a fire to emerge, as did indeed occur. <sup>21 22</sup> When a dry electrical storm was created on the morning of the 7th of February, and the winds brought down power lines, one of the deadliest wildfires in history was triggered. The most disastrous firespot was the Kinglake Fire Complex, which damaged rural areas, state forests and national parks. The day after Saturday, the weather conditions nurtured the fire expansion and it was only after weeks that the bushfires were finally extinguished. <sup>23</sup>

The "Black Saturday" bushfires resulted in the death of 173 people, while 450,000 hectares of land were destroyed and approximately 2000 houses dilapidated. <sup>24</sup>

The bushfires' impact on biodiversity was devastating, with a million livestock killed and many species dying out due to the destruction of their natural

<sup>21</sup> "Black Saturday bushfires | National Museum of Australia." <https://www.nma.gov.au/defining-moments/resources/black-saturday-bushfires>.

<sup>22</sup> "Bushfire - Black Saturday, Victoria, 2009." February 15, 2009, <https://knowledge.aidr.org.au/resources/bushfire-black-saturday-victoria-2009/>.

<sup>23</sup> "Black Saturday bushfires | National Museum of Australia." <https://www.nma.gov.au/defining-moments/resources/black-saturday-bushfires>.

<sup>24</sup> "Black Saturday bushfires | National Museum of Australia." <https://www.nma.gov.au/defining-moments/resources/black-saturday-bushfires>.



habitat, even after the bushfires' breakout. A distinctive case was that of the Leadbeater's possum, which prospered in Victoria but faced serious decline since old-hollow bearing trees were destroyed. Species which need similar conditions, such as birds who depend on hollows for shelter also faced decline.

<sup>25</sup>

The severity of these wildfires was such that the Premier Brumby called for a royal commission on 13 February 2009, with the purpose of ameliorating the strategy in place regarding the handling of bushfires. <sup>26</sup>

2. "Ash Wednesday" bushfires in 1983:

Prior to "Ash Wednesday", a ten-month drought had parched the forests of eastern Australia. On Wednesday, 16 February 1983, the situation worsened, with Victoria and South Australia dealing with high temperatures (up to the mid forties), low humidity and extremely fast and uncontrollable winds. These resulted in one of the deadliest bushfires recorded. In the state of Victoria, fire season had begun in November but by the morning of "Ash Wednesday" 104 firespots had emerged. In South Australia, two major fires were simultaneously blazing, one in Adelaide and one nearby Mount Gambier. Nevertheless, the first one was rendered controlled by the next day when rainfall emerged in Adelaide.

The firefighting service was one of 16,000 personnel while police and defence forces as well as volunteers assisted at the bushfires' elimination.

A total of 75 deaths was recorded, and more than 1,300 properties were destroyed. Additionally, 400,000 hectares of land were burnt. Regarding biodiversity loss, an amount of 340,000 sheep and 18,000 cattle were found dead.

<sup>25</sup> "Black Saturday - Forests after the fires - Victorian National ...." April 4, 2019, <https://vnpa.org.au/black-saturday-forests-after-the-fires/>.

<sup>26</sup> "Black Saturday bushfires | National Museum of Australia." <https://www.nma.gov.au/defining-moments/resources/black-saturday-bushfires>.





“Ash Wednesday” was considered the deadliest wildfire series in Australian history for more than a quarter of a century, until the “Black Saturday” bushfires broke out. <sup>27 28 29</sup>

3. “Black Thursday” bushfires in 1851:  
Bushfires had been burning in Victoria from early February. However, the major damage took place on the 6th February, 1851. On “Black Thursday” the temperature in Melbourne reached 47C at 11am, while hot air was blowing from New South Wales. The fire zone stretched from Victoria to Mount Gambier in South Australia.

The socioeconomic and environmental damage was significant but incomparable with the one of “Black Saturday”'s wildfires. 12 people were killed, and one million sheep as well as thousands of cattle died. However, the area burnt was calculated as a quarter of Victoria's size, meaning 5 million hectares of land were burnt in the fires; many communities were affected, such as Wimmera, Portland, Westernport, Dandenong, Plenty Ranges and Gippsland.

In order to assist the victims, several meetings were held to raise funds to support those affected, and committees were set up to effectively and holistically distribute them. <sup>30 31 32</sup>

4. “Black Friday” bushfires in 1939: Like the bushfires of “Ash Wednesday”, some of these destructive firespots were burning from early December of 1938, while many others began the first week of January 1939 and not on “Black Friday”. However, landowners, graziers and others had purposefully started

<sup>27</sup> "Ash Wednesday Bushfire - VIC/SA 1983 | Australian Disasters."

<https://knowledge.aidr.org.au/resources/bushfire-ash-wednesday-1983/>.

<sup>28</sup> "Ash Wednesday bushfires: February 16, 1983 - ABC ...." February 14, 2013,

<https://www.abc.net.au/news/emergency/2013-02-14/ash-wednesday-bushfires-1983-from-the-archives/4519214>.

<sup>29</sup> "On this day: Ash Wednesday bushfires - Australian Geographic."

<https://www.australiangeographic.com.au/blogs/on-this-day/2013/11/on-this-day-ash-wednesday-bushfires/>.

<sup>30</sup> "Black Thursday - Australian Disaster Resilience Knowledge Hub."

<https://knowledge.aidr.org.au/resources/bushfire-black-thursday-1851/>.

<sup>31</sup> "1851 - Bushfires in Victoria - Research Guides at State Library ...." June 19, 2020, <https://guides.slv.vic.gov.au/bushfires/1851>.

<sup>32</sup> "'Black Thursday" Bushfires 1851." <https://portphillippioneersgroup.org.au/pppg5df.htm>.



new fires previously, and on the 13th of January 1939 for land clearing, campfiring or domestic purposes. This resulted in the creation of new major firespots since windy and heatwave conditions became prevalent. Strong northerly winds resulted in these fires spreading uncontrollably. These wildfires were finally extinguished when there was rainfall on the 15th January in Victoria state.

These bushfires had devastating effects. 71 people as well as thousands of sheep, cattle and horses died, and 2 million hectares and 69 sawmills were burnt. Approximately 75% of the state was affected to some extent. More specifically, five townships were completely destroyed, namely, Narbethong, Noojee, Woods Point, Hill End and Nayook West.

Regarding the environmental impact of the bushfires, 575,000 hectares of reserved forest and 780,000 hectares of forested Crown land were burned. The soil burnt absorbed dangerous chemical substances, which resulted in the contamination of water catchments. The natural habitat of many mammals and birds was destroyed leaving such fauna without shelter.

The intensity of the wildfires and their consequences led to the formation of a Royal Commission. The recommendations of this commission primarily addressed the implementation of proper forest and fire management protocols to prevent such breakouts from occurring again in the future. <sup>33 34 35 36</sup>

## Causes of the 2019 wildfires

### Dominating climate and weather conditions

<sup>33</sup> "Black Friday bushfires, VIC 1939 | Australian Disasters."

<https://knowledge.aidr.org.au/resources/bushfire-black-friday-victoria-1939/>.

<sup>34</sup> "'Black Friday' bushfires | Environment & Society Portal."

<http://www.environmentandsociety.org/tools/keywords/black-friday-bushfires>.

<sup>35</sup> "Black Friday 1939 - Forest Fire Management Victoria." June 10, 2017,

<https://www.ffm.vic.gov.au/history-and-incidents/black-friday-1939>.

<sup>36</sup> "Black Friday: The day a "ring of bushfires" devastated Victoria." January 13, 2020,

<https://thenewdaily.com.au/news/2020/01/13/bushfires-victoria-black-friday/>.



Australia experienced one of the driest years in 2019, which adding to the other weather conditions drastically affected the expansion and the spread of the fires.<sup>37 38</sup> In many parts, the high temperatures were not conducive to the drought that has been prevalent for years, coming to an end in the slightest. On the 18th December 2019, the highest temperature to date, one of 41.9C was recorded, and by the time bushfires reached their peak, every state had already experienced a heatwave above 40C.<sup>39</sup> Furthermore, in areas where firespots occurred, the dryness, as well as the fact that the lowest amount of rainfall to ever have emerged was recorded at these places from January to August 2019, contributed to the intensity and graveness of the fire.<sup>40</sup>

### Climate drivers

2019's fire season was prolonged due to extreme weather conditions, some of such caused by two of Australia's climate drivers, namely the Indian Ocean Dipole (IOD) and Southern Annular Mode (SAM).

The strongest positive IOD since 1997 was in effect in 2019, provoking a heatwave and droughts all across southeast Australia. The IOD was also responsible for the notable decline in the amount of rainfall which further nurtured the dryness of the state. It was expected to end by the end of November, though due to the monsoon season being delayed, its influence was prolonged for a month, meaning it would die off by the beginning of January. Regarding SAM, in 2019, this climate driver went through a negative phase, meaning it blew hot and dry winds from central Australia to New South Wales and South Queensland, and was expected to break down by mid January. The simultaneous effect of these climate drivers increased the fire risk and thus its intensity upon occurrence.<sup>41</sup>

<sup>37</sup> "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.

<sup>38</sup> "Climate Change Affected Australia's Wildfires, Scientists Confirm." March 4, 2020, <https://www.nytimes.com/2020/03/04/climate/australia-wildfires-climate-change.html>.

<sup>39</sup> "Australia - BBC News - BBC.com." <https://www.bbc.com/news/world/australia>.

<sup>40</sup> "Australia Bushfires: Cause, Impact, and Restoration | One ...." <https://onetreepanted.org/blogs/stories/australia-bushfires>.

<sup>41</sup> "Positive Indian Ocean Dipole fuels bushfires ... - ABC." December 11, 2019, <https://www.abc.net.au/news/2019-12-11/indian-ocean-dipole-fuels-dry-australia-bushfires-africa-rain/11787874>.



## Climate change

Whether climate change had a role in the bushfires' breakout was an issue controversially debated upon when Australia's wildfires emerged. Nevertheless, it was then scientifically proven that its influence on the risk of fire was one of 30%. In fact, scientists support that it was far larger than this but it was difficult to establish an exact measurement due to the other factors' presence. It is believed that climate change has majorly affected southeastern provinces of Australia, particularly during the two-month period of the fires' peak (December-January). Survey results from a study conducted by an expert team of the World Weather Attribution (WWA) have excluded any apparent influence of this phenomenon on the rainfall decline but supported that it had a clear effect on the extension of the fire season extension as well as the severity of the bushfires. <sup>42 43 44</sup>

## Pyroculonimbus clouds

In Australian areas with ongoing firespots, such as Victoria and New South Wales, a weather phenomenon called "dry thunderstorm" started to appear following the formation of pyroculonimbus clouds. <sup>45</sup> These are usually formed when extreme heat is present. The heat brings high temperatures, which combined with the uncontrolled firespots as well as the smoke create ideal conditions for their emergence. Such storms contain little rainfall and dry lightnings, resulting in the emergence of new bushfires, as was the case at East Gippsland where a number of the fires were ignited by such lightnings.<sup>46</sup> Consequently, the more frequent they become the more uneven and rapid the fire turns. <sup>47</sup>

<sup>42</sup> "Australia Bushfires: Cause, Impact, and Restoration | One ..."<https://onetreepanted.org/blogs/stories/australia-bushfires>.

<sup>43</sup> "Australia wildfires: communities must stay vigilant ... - UN News." November 12, 2019, <https://news.un.org/en/story/2019/11/1051131>.

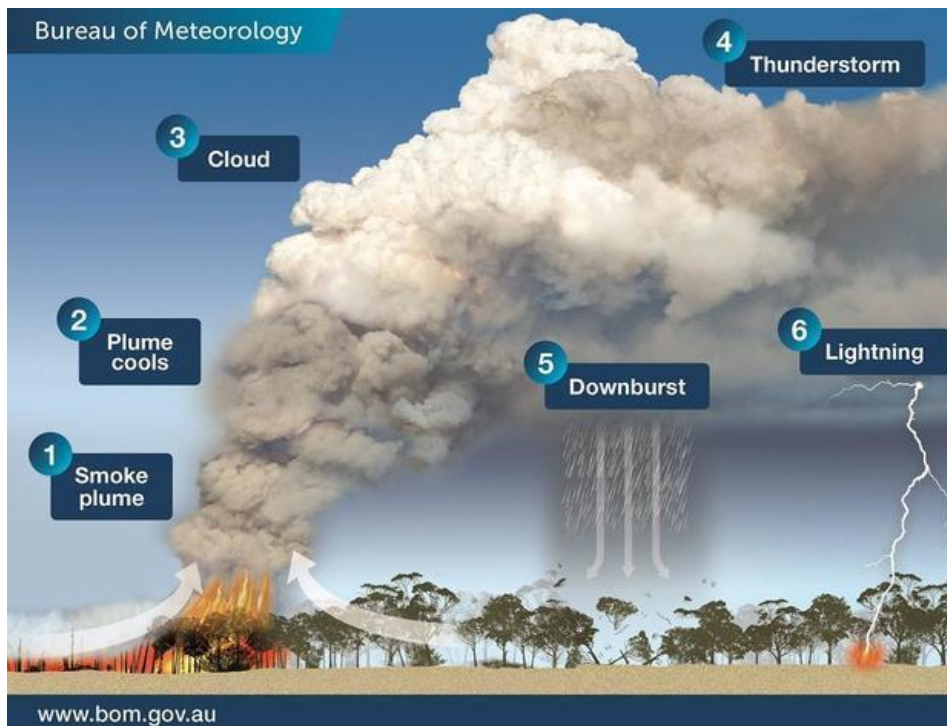
<sup>44</sup> "Climate Change Affected Australia's Wildfires, Scientists Confirm." March 4, 2020, <https://www.nytimes.com/2020/03/04/climate/australia-wildfires-climate-change.html>.

<sup>45</sup> "Fires in Australia: Bushfires are creating ... - CBS News." December 30, 2019, <https://www.cbsnews.com/news/fires-in-australia-pyrocumulonimbus-thunderstorm-clouds-victoria-sydney/>.

<sup>46</sup> "Australia wildfires: Here's what you need to know ... - CNN.com." 13 Ιαν. 2020, <https://www.cnn.com/2020/01/01/australia/australia-fires-explainer-intl-hnk-scli/index.html>. Πρόσβαση στις 6 Αυγ. 2020.

<sup>47</sup> "Australia wildfires: Here's what you need to know ... - CNN.com." January 13, 2020, <https://www.cnn.com/2020/01/01/australia/australia-fires-explainer-intl-hnk-scli/index.html>.





*Fig. 1: Initially, a plume of smoke and air is formed which as it rises chills due to the air temperature and results in a cooler cloud. However, unlike thunderstorms, during rainfall the rain mixes with the dry air and thus evaporates by the heat and dryness of the fire leading to the creation of what is called a downburst meaning the creation of high-speed winds towards ground. These factors along with the dry lightnings which emerge from such clouds provide conducive conditions for a bushfire to emerge or worsen. <sup>48</sup> <sup>49</sup>*

### Wildfires' ignition and expansion

The first bushfires in Australia emerged prior to June, however, more fires began during September 2019, while the fire season officially started in October 2019 with

<sup>48</sup> "The Daily Telegraph (Sydney): 2019-11-11 ... - PressReader." November 11, 2019 <https://www.pressreader.com/australia/the-daily-telegraph-sydney/20191111/281599537317349>.

<sup>49</sup> "Fires in Australia: Bushfires are creating ... - CBS News." December 30, 2019, <https://www.cbsnews.com/news/fires-in-australia-pyrocumulonimbus-thunderstorm-clouds-victoria-sydney/>.

the 26th being the peak of this season, when lightning ignited the epicentre of the biggest firespot, in Gosper Mountains, New South Wales. <sup>50</sup> <sup>51</sup> New South Wales and Victoria were the main regions where firespots occurred, with a state of emergency being declared in both regions on 11 November 2019. Later on, as the fires continued to expand, the Prime Minister of Victoria declared a state of disaster, for the areas of Victoria that faced with the worst damage, on the 2nd of January 2020 till the 11th <sup>52</sup> <sup>53</sup>, while the Australian Capital Territory declared a state of emergency in south Canberra by the end of January. <sup>54</sup> The massive infernos in bushland, forest areas and national parks, after having caused severe societal damage and damage to Australia's biodiversity, with the fires at Kangaroo Island proving devastating, were all extinguished during several waves of rainfall, which along with the firefighting efforts, finally brought Australia's fire season to an end by the 4th of March. <sup>55</sup>

### Measures for fire management and citizens' protection

The government has faced great criticism for delaying in properly addressing the fires, particularly following a situation where Prime Minister Scott Morrison had gone to holidays in Hawaii, while bushfires in the Blue Mountains had resulted in Sydney facing grave air pollution from the smoke of the fires. The government had also initially neglected a request that had been made over a year before the fires began, calling for more funds to be directed at Australia's firefighting fleet on aerial vessels.

The Australian Government adopted important measures to deal with the grave situation, despite doing so with great delay. Two evacuation plans were also implemented, with the first one conducted on 28 December 2019 at East Gippsland

<sup>50</sup> "Australian bushfires: A timeline of what's happened so far ...."

<https://www.createdigital.org.au/australian-bushfires-a-timeline-of-whats-happened-so-far/>.

<sup>51</sup> "When and how the Australia bushfires started in 2019 - Insider." January 8, 2020,

<https://www.insider.com/when-how-australia-bushfires-started-in-2019-2020-1>.

<sup>52</sup> "When and how the Australia bushfires started in 2019 - Insider." January 8, 2020,

<https://www.insider.com/when-how-australia-bushfires-started-in-2019-2020-1>.

<sup>53</sup> "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.

<sup>54</sup> "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.

<sup>55</sup> "2019-2020 Australian Bushfires - Center for ...." September 9, 2019,

<https://disasterphilanthropy.org/disaster/2019-australian-wildfires/>.



and the other on 10 January. Another evacuation took place in the areas with burning fire spots in the South Australian provinces at risk from the fires. However, it was also rendered necessary for Australia to open 15 evacuation centers in the South Coast. In Mallacoota, over 4000 people sought shelter on the coast. Additionally, the government deployed local emergency services, as well as the country's military, to tackle the fire with vessels, aircraft vehicles, and Chinook helicopters. Over AUD\$20 million (US\$14,368,641) was directed to the leasing of 4 water bombers. Over 3000 reservists also aided in ameliorating the situation, assisting in firefighting operations, organizing evacuations and rescue operations. The military also provided humanitarian assistance in terms of emergency services such as by conducting evacuation plans. <sup>56 57 58 59</sup>



<sup>56</sup> "Morrison's government on the bushfires: from attacking climate ...." January 4, 2020, <https://www.theguardian.com/australia-news/2020/jan/04/morrison-s-government-on-the-bushfires-from-attacking-climate-lunatics-to-calling-in-the-troops>.

<sup>57</sup> "What you need to know about the Australia bushfires - The ...." February 13, 2020, <https://www.theverge.com/2020/1/3/21048891/australia-wildfires-koalas-climate-change-bushfires-deaths-animals-damage>.

<sup>58</sup> "Australia fires: Troops called to tackle fires - BBC ... - BBC.com." <https://www.bbc.com/news/world-australia-50986363>.

<sup>59</sup> "Australia fires: Military to be deployed to help rescue effort - BBC." <https://www.bbc.com/news/world-australia-50956318>.

<sup>60</sup> "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.



*Fig. 2: An animal rescuer, Marcus Fillinger, carries a kangaroo which was injured during the fire to a reserve for burned koalas so it can then be transported to a recovery center.* <sup>61</sup>

## Consequences of 2019 wildfires

### Social, economical and environmental impact

The bushfires that emerged in Australia in 2019 proved to be devastating, with 34 people being killed and approximately 18 million hectares of land being burnt. More than 2,700 houses were also destroyed. <sup>62</sup>

The losses which were a direct impact of the wildfires as well as of the overall panic and trepidation that emerged due to the emergency and graveness of the situation is likely to have resulted in mental health problems for many survivors. This was also the case in the aforementioned Black Saturday fires, of which as a result 15% of emergency respondents reported suffering from PTSD, 13% reported suffering from depression, and nearly a quarter of them reported having resorted to heavy drinking as a coping mechanism. <sup>63</sup>

The smoke released from the wildfires in Victoria and NSW caused the worst air pollution levels Australia has ever experienced, with the index of air quality in Sydney reaching a level 11 times more than what is considered “hazardous” and a risk to public health. In January of 2020, Canberra had the worst air quality index than any other major city worldwide. <sup>64</sup> The consequences of the black carbon in the atmosphere in human health were such that a woman lost her life due to respiratory distress. Moreover, it shall not be omitted that this emancipation also resulted in the problem of climate change gaining more intensity and graveness, as the fires released

<sup>61</sup> "The Animals that Survived Australia's Fires (PHOTOS) | The ...." February 7, 2020, <https://weather.com/news/news/2020-02-07-animals-koalas-kangaroos-survive-australia-bush-fires-photos>.

<sup>62</sup> "Australian Bushfires - WWF-Australia - WWF-Australia." <https://www.wwf.org.au/what-we-do/bushfires>.

<sup>63</sup> "How the Bushfires Threaten Australians' Mental Health | Time." January 8, 2020, <https://time.com/5759685/australian-bushfires-mental-health/>.

<sup>64</sup> "Ten impacts of the Australian bushfires - UN Environment ...." January 22, 2020, <https://www.unenvironment.org/news-and-stories/story/ten-impacts-australian-bushfires>





monumental amounts of carbon dioxide, numbering at about 900 tons<sup>65</sup>. In addition, the chemical elements of bushfire ashes contaminated water catchments, affecting aquatic life as well as the public. <sup>66 67</sup>

A significant number of businesses were shut down, because of the wildfires' impact on their property. For example, farmers at the areas where firespots occurred faced serious economic problems since rural places such as farmlands were immediately devastated, with the exception of some areas where Aboriginal Techniques were drastically implemented. <sup>68</sup>



*Fig.3: In the picture, plumes of smoke appear soaring from the devastating wildfires that emerged in Victoria, on the coast of East Gippsland. It depicts the magnitude of the air pollution which was caused by the series of bushfires in 2019 and had terrible*

<sup>65</sup> "Australia wildfires unleash millions of tons of carbon dioxide." January 22, 2020, <https://www.nbcnews.com/science/environment/australia-wildfires-unleash-millions-tons-carbon-dioxide-n1120186>.

<sup>66</sup> "Australia wildfires: Here's what you need to know ... - CNN.com." January 13, 2020, <https://www.cnn.com/2020/01/01/australia/australia-fires-explainer-intl-hnk-scli/index.html>.

<sup>67</sup> "What you need to know about the Australia bushfires - The ...." February 13, 2020, <https://www.theverge.com/2020/1/3/21048891/australia-wildfires-koalas-climate-change-bushfires-deaths-animals-damage>.

<sup>68</sup> "Ten impacts of the Australian bushfires - UNEP." <https://www.unenvironment.org/news-and-stories/story/ten-impacts-australian-bushfires>.

<sup>69</sup> "When and how the Australia bushfires started in 2019 - Insider." January 8, 2020, <https://www.insider.com/when-how-australia-bushfires-started-in-2019-2020-1>.

*consequences in human health, the phenomenon of climate change and water purity.*

### Biodiversity loss

Over 1.25 billion animals have been reported dead as a result of the fires.<sup>70</sup> Wildlife has been and will be impacted in Australia due to the disastrous consequences of the wildfires. The impact was predictable as many firespots emerged in forest areas and national parks, in East Gippsland, Queensland, Tasmania, West and South Australia provinces, northeast Victoria and approximately 80 percent of the terrestrial species sought shelter there. A terrible biodiversity loss was also recorded because of the bushfires emerging at vulnerable ecosystems which had an abundance of endangered species, namely Queensland's rainforests, Kangaroo Island with a number of treasured biological diversity, Eucalypt forests at East Gippsland, the national park of Kosciuszko as well as the alpine places in Victoria and NSW.<sup>71 72</sup>

Numerous fauna perished as they were burned or soaked the toxic chemicals produced by the fire's smoke. Even animals not directly affected by the fire have and will continue to face difficulties, given that for many species, their habitats and food sources have been burnt, making survival a great challenge.<sup>73 74</sup> Furthermore, some predators such as feral cats and red foxes have taken advantage of such fire breakouts by tracking them down and feeding on any animals that may have survived the fires, thus posing an additional threat to the impacted wildlife.<sup>75</sup>

<sup>70</sup> "Australian Bushfires - WWF-Australia - WWF-Australia." <https://www.wwf.org.au/what-we-do/bushfires>.

<sup>71</sup> "Ten impacts of the Australian bushfires - UNEP." <https://www.unenvironment.org/news-and-stories/story/ten-impacts-australian-bushfires>.

<sup>72</sup> "Bushfires Devastate Australian Biodiversity, with Species ...." January 9, 2020, <https://theenergymix.com/2020/01/09/bushfires-devastate-australian-biodiversity-with-species-extinction-likely/>.

<sup>73</sup> "Millions of animals are dying from the Australian wildfires - CNN." January 8, 2020, <https://www.cnn.com/2020/01/07/australia/australia-fire-wildlife-deaths-intl-hnk-scli/index.html>.

<sup>74</sup> "Australia wildfires: Here's what you need to know ... - CNN.com." January 13, 2020, <https://www.cnn.com/2020/01/01/australia/australia-fires-explainer-intl-hnk-scli/index.html>.

<sup>75</sup> "Australia fires: Why species might go extinct, explained ... - Vox." January 10, 2020, <https://www.vox.com/energy-and-environment/2020/1/9/21057375/australia-fire-wildlife-extinctions-ecology>.



Threatened species with a smaller population to begin with, thus being at a higher extinction risk include the Eastern Bristlebird, the Corroboree Frog and the Mountain Pygmy Possum. However, a huge and reasonable conundrum has arisen in regards to koalas, which have a greater distribution than other wildlife but faced great losses in the fires; in Kangaroo Island alone, 35,000 koalas died from the fire. National parks are hosting an abundance of threatened species e.g. squirrel gliders, masked owls, turquoise parrots and brown treecreepers. A dystopian yet very plausible outcome, flora and fauna which fail to adapt to the new conditions are and will continue dying out, while simultaneously many are expected to adapt to the new environment by turning to fire-prone species, in a way many species have already done in the past. Plants are also facing notable losses, such as the Wollemi Pine, whose population is as a result of the fires confined to 100 plants. <sup>76 77 78</sup>

## Major countries and organizations involved

A significant number of countries, organizations as well as citizens have offered significant aid to Australia by means such as but not limited to firefighting and military assistance, the provision of firefighting vehicles as well as of goods and donations. Many countries have also offered remarkable financial aid. The criticism that Scott Morrison was negligent because of his inactiveness in properly addressing the situation on time contributed to there being such great foreign intervention to ameliorate the problem which worsened as a result of Morrison's negligence. However, countries such as the United States and Vanuatu provided remarkable

<sup>76</sup> "Millions of animals are dying from the Australian wildfires - CNN." January 8, 2020, <https://www.cnn.com/2020/01/07/australia/australia-fire-wildlife-deaths-intl-hnk-scli/index.html>.

<sup>77</sup> "Australia fires: Why species might go extinct, explained ... - Vox." January 10, 2020, <https://www.vox.com/energy-and-environment/2020/1/9/21057375/australia-fire-wildlife-extinctions-ecology>.

<sup>78</sup> "Bushfires Devastate Australian Biodiversity, with Species ...." January 9, 2020, <https://theenergymix.com/2020/01/09/bushfires-devastate-australian-biodiversity-with-species-extinction-likely/>.



assistance out of solidarity, given that Australia had provided aid to them when it was previously needed. <sup>79</sup> <sup>80</sup> <sup>81</sup>

### United States

As mentioned above, the United States provided assistance primarily because of the bilateral agreement in place with Australia and New Zealand regarding the ability of exchanging assistance in cases of such emergency, as was the case in 2018, <sup>82</sup> when officials said that the conditions were conducive for such help to be offered since the fire season of Australia and of the US didn't coincide. <sup>83</sup> Therefore, the country aided efforts at the extinguishing of the fire, not only with firefighting assistance amounting to over 150 firemen and wildfire specialists, <sup>84</sup> but also with wildland fire personnel which totalled to 298 people from December to February. <sup>85</sup>

### New Zealand

The state of New Zealand not only enforced the fire battle with 179 firefighters but also with the provision of military forces. Australia accepted the offer of troops along with three NH90 helicopters aimed at assisting the Australian Defence Force. These were utilised for vital transportation during the crisis. It

<sup>79</sup> "U.S. sends firefighters to Australia to help fight blazes ...." January 7, 2020,

<https://share.america.gov/u-s-sends-firefighters-to-australia-to-help-fight-blazes/>.

<sup>80</sup> "Australia fires: How the world has responded to the crisis - BBC." January 6, 2020,

<https://www.bbc.com/news/world-australia-51024904>.

<sup>81</sup> "Australia bushfires: What countries have offered international ...." January 6, 2020,

<https://www.euronews.com/2020/01/06/australia-bushfires-what-countries-have-offered-international-aid>.

<sup>82</sup> "firefighting efforts in Australia. - National Interagency Fire Center." March 3, 2020,

[https://www.nifc.gov/fireInfo/fireInfo\\_australia.htm](https://www.nifc.gov/fireInfo/fireInfo_australia.htm).

<sup>83</sup> "U.S. sends more than 100 firefighters to help Australia battle ...." January 2, 2020,

<https://www.latimes.com/world-nation/story/2020-01-02/la-me-australia-fires-us-helps-firefighters>.

<sup>84</sup> "U.S. sends firefighters to Australia to help fight blazes ...." January 7, 2020,

<https://share.america.gov/u-s-sends-firefighters-to-australia-to-help-fight-blazes/>.

<sup>85</sup> "firefighting efforts in Australia. - National Interagency Fire Center." March 3, 2020,

[https://www.nifc.gov/fireInfo/fireInfo\\_australia.htm](https://www.nifc.gov/fireInfo/fireInfo_australia.htm).



also contributed two army engineer divisions, a command element and a total of 80 defence personnel. <sup>86 87</sup>

### Papua New Guinea (PNG)

The Prime Minister of PNG, James Murape, after communication with Scott Morrison, offered Australia 1,000 soldiers and firefighters. However, the Australian government was called to evaluate the consequences of accepting such an offer. If it did, that would enhance good relations between the two states by creating a stronger bond and feeling of solidarity, but because of PNG's lack of resources, the state of PNG would not be able to cover the expenses. Ultimately, 100 soldiers from Papua New Guinea were deployed in Australia, with 76 of them being engineering battalions while the rest served as field engineers and support staff. The assistance provided cost the PNG government approximately US\$1 million (AUS\$1,187,195). <sup>88 89</sup>

### Vanuatu

Vanuatu provided financial assistance to the bushfire emergency appeal with 20 million vatus (US\$175,959), which were given to the Rural Fire Service and to assist bushfire victims. Many Vanuatu workers in Australia were in a suspended state and economically devastated during and after the fire. <sup>90 91 92</sup>

<sup>86</sup> "Australia bushfires: New Zealand Defence Force sending ...." January 5, 2020, <https://www.newshub.co.nz/home/politics/2020/01/australia-bushfires-new-zealand-defence-force-sending-support-to-australia.html>.

<sup>87</sup> "New Zealand sends troops to help with Australian bushfires as ...." January 6, 2020, <https://www.theguardian.com/australia-news/2020/jan/06/new-zealand-sends-troops-to-help-with-australian-bushfires-as-pacific-nations-offer-support>.

<sup>88</sup> "Australia fires: PNG offers military support | RNZ News." January 6, 2020, <https://www.rnz.co.nz/news/pacific/406756/australia-fires-png-offers-military-support>.

<sup>89</sup> "Australia fires: PNG to send 100 soldiers | RNZ News." January 10, 2020, <https://www.rnz.co.nz/international/pacific-news/407028/australia-fires-png-to-send-100-soldiers>.

<sup>90</sup> "Pacific nations Vanuatu and PNG pledge aid for Australia's ...." January 6, 2020, <https://www.abc.net.au/news/2020-01-06/pacific-nations-pledge-aid-for-australias-bushfires/11844008>

<sup>91</sup> "VANUATU ASSISTS AUSTRALIA | News | dailypost.vu." January 6, 2020, [https://dailypost.vu/news/vanuatu-assists-australia/article\\_1b5c3a12-3002-11ea-84d5-df559b895c14.html](https://dailypost.vu/news/vanuatu-assists-australia/article_1b5c3a12-3002-11ea-84d5-df559b895c14.html).

<sup>92</sup> "Pacific nations Vanuatu and PNG pledge aid for Australia's ...." January 6, 2020, <https://www.abc.net.au/news/2020-01-06/pacific-nations-pledge-aid-for-australias-bushfires/11844008>



## Canada

Canada has also confronted a wildfire emergency in the past (2018) and Australia, among other countries, offered major aid. To supply Australia with the resources needed, a liaison officer from CIFFC was sent there in order to evaluate the situation of the raging bushfires.<sup>93</sup> Canada out of solidarity, not only provided the country with 77 firefighters, with additional deployments returning after assisting to the wildfires' crisis, from December but also with expertise personnel to assist in terms of logistics, aviation and planning.<sup>94</sup>

## France

The President of France, Emmanuel Macron, during his call with the Prime Minister of Australia, Scott Morrison expressed his solidarity for the alert situation that Australia was facing and offered immediate operational assistance, with a group of five firefighting experts arriving in Australia to offer their knowledge regarding improvements that can be made in terms of fire management, as well as to evaluate Australia's needs and to be able to assist more effectively. Macron noted that he wanted to help Australia deal with the bushfires, particularly regarding the protection of citizens and the conservation of biodiversity conservation. Additionally, the provided assistance also had the purpose of laying the foundations for better relations between the countries so to allow for a form of an informal mutual assistance pact between France and Australia against bushfires' breakouts in either country whenever is the case.<sup>95 96</sup>

## United Kingdom

The UK had sent a team of experts to evaluate the situation in Australia regarding the bushfires in order to find the ideal way to contribute in the

<sup>93</sup> "Canada stands ready to assist Australia in fighting raging ...." 13 Nov. 2019, <https://www.rcinet.ca/en/2019/11/13/canada-stands-ready-to-assist-australia-in-fighting-raging-wildfires/>.

<sup>94</sup> "77 Canadians on their way to help Australia as ... - Global News." January 16, 2020, <https://globalnews.ca/news/6423641/77-canadian-fire-fighters-australia/>.

<sup>95</sup> "Australia fires: PNG offers military support | RNZ News." January 6, 2020, <https://www.rnz.co.nz/news/pacific/406756/australia-fires-png-offers-military-support>.

<sup>96</sup> "5 French experts in Australia to provide assistance in the ...." February 27, 2020, <https://au.ambafrance.org/5-French-experts-in-Australia-to-provide-assistance-in-the-bushfires-crisis>.



emergency based on Australia's needs.<sup>97</sup> Additionally, the government sent members of the Royal Botanic Gardens to aid in the emergent process of collecting seeds of plants expected to face serious decline as a result of the fires<sup>98</sup>. Ultimately, a team comprising of retired as well as active firemen, numbered at approximately 300 men, in collaboration with BlazeAid, traveled to Australia to contribute in restoration efforts of burnt landscapes.<sup>99</sup>

### Australian Wildlife Conservancy (AWC)

The land experts of the AWC organized fire management strategies to deal with fire regimes in northern and central Australia, where their knowledge in the ecology of the area is vital. This organization particularly stresses the importance of the conservation of biodiversity since wildfires' breakouts have a direct impact there.<sup>100</sup>

### WWF-Australia

Responding directly to the bushfire disaster that Australia faced the year of 2019, the WWF provided emergency funds to over 40 organisations that fought to rehabilitate and rescue animals affected by the fires. Moreover, this entity is still collaborating with local authorities and organizations to ensure the long-term restoration of ecosystems and the long-term future protection of flora and fauna from such bushfires.<sup>101</sup>

### Wildlife Victoria's

As an organisation, Wildlife Victoria targets the sensitization of the citizens regarding Australian wildlife and problems faced, the report and immediate response to every wildlife emergency as well as the need for and ways to protect flora and fauna in the province. A team was recruited to deal with such

<sup>97</sup> "Team of UK experts to help fight Australian bushfires - GOV.UK." January 9, 2020, <https://www.gov.uk/government/news/team-of-uk-experts-to-help-fight-australian-bushfires>.

<sup>98</sup> "Further UK assistance to fight Australian bushfires announced ...." 6 Feb. 2020, <https://www.gov.uk/government/news/further-uk-assistance-to-fight-australian-bushfires-announced-as-foreign-secretary-visits-worst-hit-state>. Accessed 11 Aug. 2020.

<sup>99</sup> "Australia fires: British firefighters to assist with clean-up - BBC ...." 5 Feb. 2020, <https://www.bbc.com/news/uk-england-51191679>. Accessed 11 Aug. 2020.

<sup>100</sup> "Burning the fire continent - AWC - Australian Wildlife ...." May 15, 2020, <https://www.australianwildlife.org/burning-the-fire-continent/>.

<sup>101</sup> "WWF-Australia." <https://www.wwf.org.au/>.



emergencies, which comprised of rescuers, veterinarians and carers who assist in the animals' rehabilitation process. A bushfire appeal was set up, and the organization has pledged it will work with shelters involved in the bushfire for a year, to ensure they do not face shortages of resources or other such problems.<sup>102 103</sup>

## Timeline of events

Date	Event
26 October 2019	Lightning sparks a huge wildfire in Gosper Mountains, NSW, which was going to evolve as the epicentre of these year's wildfires, while a dry electrical storm also triggers a bushfire at Macquarie, NSW.
28 October 2019	Fire spots are augmenting with a new one in Cattai, NSW. The fire in Macquarie has reached Crowdy Bay National Park. The first death is reported.
11 November 2019	NSW and Queensland declare a state of emergency, while three people have already lost their lives in these states.

<sup>102</sup> "About Us - Wildlife Victoria." <https://www.wildlifevictoria.org.au/about/about-us>.

<sup>103</sup> "Helping wildlife during bushfires - Wildlife Victoria." <https://www.wildlifevictoria.org.au/?view=article&id=145:helping-wildlife-during-bushfires&catid=11:wildlife-information..>





12 November 2019	Fire threatens parts of Lane Cove National Park. A number of schools in NSW shut down. Firefighting aid arrives from New Zealand. Mr Morrison calls the military to assist firefighters.
20 November 2019	A new firespot in Yorke Peninsula, in South Australia threatens residential areas, with property being destroyed.
8 December 2019	Arrival of the US firefighting assistance to join the tackling of the bushfires.
21 December 2019	A wildfire at East Gippsland causes the creation of “pyrocumulonimbus” clouds via the smoke produced by the fires, resulting in new firespots.
26 December 2019	Another fire triggered by lightning breaks out in the Sterling Ranges at West Australia.
28 December 2019	Evacuation is ordered in East Gippsland as the fire continues spreading.
30 December 2019	Major roads in and out of the area are closed leaving those who didn’t cooperate with authorities’ orders trapped in East Gippsland. The Country Fire Authority (CFA) informs via social media (twitter) that non-evacuators must not rely on firefighting and emergency assistance.



<p><u>31 December 2019</u></p>	<p>A total of 16 deaths have been reported. Three new firespots threaten Australian wildlife at: Currowan <sup>104</sup>, Charley’s Forest and Clyde Mountain (threat to Mogo Zoo). <sup>105</sup></p>
<p><u>2 January 2020</u></p>	<p>The Premier of NSW declares a state of emergency, while the one in Victoria a state of disaster.</p>
<p><u>3 January 2020</u></p>	<p>A devastating fire breaks out at Kangaroo Island, burning the one third of the island and causing a huge biodiversity loss (25,000 Koalas dead on Kangaroo Island). <sup>106</sup> <sup>107</sup></p>
<p><u>4 January 2020</u></p>	<p>The fire expands, reaching the area of Snowy Mountains with pine forests and resulting in the perishing of a substantial amount of fauna and flora.</p>
<p><u>6 January 2020</u></p>	<p>The Australian Federal government allots AUD\$2 billion (\$1.4 million) as a recovery fund. Weather conditions become mild and the bushfires’ situation easens.</p>
<p><u>20 January 2020</u></p>	<p>Snowy Mountains are still burning, with 332,100 hectares already having burnt.</p>

<sup>104</sup> "Starving, thirsty Australian wildlife on NSW south coast ... - ABC." February 1, 2020, <https://www.abc.net.au/news/2020-02-02/starving-thirsty-australian-wildlife-on-nsw-south-coast/11916690>.

<sup>105</sup> "Mogo Zoo: NSW bushfires, Clyde Mountain fire threatens ...." December 30, 2019, <https://www.news.com.au/technology/environment/heroic-job-mogo-zoo-staff-protect-animals-threatened-by-outofcontrol-new-south-wales-fire/news-story/af04d00faf13063f233a78cb472fd9cf>.

<sup>106</sup> "Australia bushfire crews battle mega blaze near Snowy ... - BBC." January 10, 2020, <https://www.bbc.com/news/world-australia-51052042>.

<sup>107</sup> "Wildlife loss in Australia much bigger than it appears." January 16, 2020, <https://www.aa.com.tr/en/environment/wildlife-loss-in-australia-much-bigger-than-it-appears/1704885>.



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Fires at all provinces have been contained. <sup>108</sup>

109 110 111

## Previous attempts to solve the issue

The state of Australia allocated \$50 million AUD to conserve biodiversity by helping affected species of flora and fauna whose habitat was destroyed, to recover by conserving their ecosystem to as great of an extent as possible following the fires. A million out of the aforementioned amount is being directed at establishing an emergency fund for times when intervention is necessary to aid animals and plants affected by the emergency at hand. The rest of the fund was given to conservation parks, zoos and other establishments caring for affected species. <sup>112</sup>

An expert group, guided by Threatened Species Commissioner Dr Sally Box, counseled the Government on how to adequately compensate for the biodiversity loss and ensure the well-being of such species of flora and fauna.

The government of Australia in December cooperated with koala experts and entrusted AUD\$6 million (US\$4.1 million) to ensure the conservation or at least the existence of natural habitats for the mentioned species to prevent their endangerment or extinction. <sup>113</sup>

<sup>108</sup> "2019-2020 Australian Bushfires - Center for ...." September 9, 2019, <https://disasterphilanthropy.org/disaster/2019-australian-wildfires/>.

<sup>109</sup> "Australian bushfires: A timeline of what's happened so far ...." <https://www.createdigital.org.au/australian-bushfires-a-timeline-of-whats-happened-so-far/>.

<sup>110</sup> "When and how the Australia bushfires started in 2019 - Insider." January 8, 2020, <https://www.insider.com/when-how-australia-bushfires-started-in-2019-2020-1>.

<sup>111</sup> "Australia is promising \$2 billion for the fires. I ... - CNN.com." 10 Jan. 2020, <https://www.cnn.com/2020/01/10/perspectives/australia-fires-cost/index.html>. Πρόσβαση στις 7 Αυγ. 2020.

<sup>112</sup> "Bushfire Relief and Recovery - Australian High Commission." <https://uk.embassy.gov.au/hlh/bushfirerecovery.html>.

<sup>113</sup> "Millions of animals are dying from the Australian wildfires - CNN." January 8, 2020, <https://www.cnn.com/2020/01/07/australia/australia-fire-wildlife-deaths-intl-hnk-scli/index.html>.



Australia's Strategy for Nature 2019-2030:

This strategy, consisting of new methods and practices, not only has the objective of helping biodiversity survive, adapt and recover, especially since Australia was facing a significant problem of notable biodiversity loss even before the 2019 bushfires, but also aims to sustainably and effectively manage nature in every landscape, for it to be a proper habitat for wildlife.<sup>114</sup>

Australia's Biodiversity Conservation Strategy 2010-2030:

This strategy points out the emergent need to conserve biodiversity, given that phenomena such as wildfires are threatening their vitality, and goes on to set targets regarding the issues and measures which need to be addressed and implemented in order to achieve them.<sup>115</sup>

National Approach to Biodiversity Decline:

The Biodiversity Decline Working Group, after reviewing past biodiversity conservation programs, identified the manner with which such a guideline should be applied and the ways to deal with the ongoing biodiversity decline. The measures reported address three thematic areas, habitat loss, the threats posed to the wellbeing of wildlife, as well as the impact climate change has on biodiversity.

Environment Protection and Biodiversity Conservation Act 1999:

Among other objectives, this act proposes measures which target the protection of native and migratory species, given that Australia constitutes a biodiversity hotspot with an abundance of threatened species. Moreover, another objective appears to be the conservation of the natural habitats of wildlife as well as the elimination of actions that threaten those. Such measures, if implemented, will be effective in ameliorating the problem of biodiversity loss since even after the fires, similar situations dominate. <sup>116</sup>

<sup>114</sup> "Australia's Strategy for Nature 2019-2030 | Australia's Nature ...."  
<https://www.australiansnaturehub.gov.au/national-strategy>.

<sup>115</sup> "Australia's Biodiversity Conservation Strategy 2010-2030 - PDF."  
<https://library.dbca.wa.gov.au/static/FullTextFiles/070234.pdf>.

<sup>116</sup> "Environment Protection and Biodiversity Conservation Act 1999."  
[http://extwprlegs1.fao.org/docs/pdf/aus17072\\_Volume1.pdf](http://extwprlegs1.fao.org/docs/pdf/aus17072_Volume1.pdf).



## Relevant UN resolutions, events, treaties and legislation

### UN Convention on Biological Diversity (CBD)

This Convention, signed by 150 member countries, aims to achieve the conservation of biodiversity and the sustainable use of its components, but also notes that every benefit that arises from genetic resources ought to be utilized properly and equally amongst societies. <sup>117</sup>

### Post-2020

A framework is to be prepared by the countries attending the Convention on Biological Diversity Conference, based on the three major objectives set in the UN Convention on Biological Diversity. Its primary focus will be urging authorities and society to play their part in achieving at least some of the convention's targets. Moreover, it wishes to assist in getting the 2030 agenda for Sustainable Development to go into effect. Lastly, evaluation of the causes of biodiversity loss is being conducted and the outcome is going to cause a huge alteration in the methods used to deal with the issue, so to ensure better tackling and prevention of terrible crises such as that of the 2019 wildfires. <sup>118</sup>

## Possible solutions

The 2019 wildfires in Australia resulted in terrible social and economical consequences with a severe impact on Australia's biodiversity. A number of 12.25 million hectares were burned and rural areas that once served as natural habitats for many species are now destroyed and inhabitable. Therefore, it is necessary to come up with ways to conserve biodiversity since the magnitude of the problem due to such disasters grows constantly.

<sup>117</sup> "Sustaining Life on Earth - Convention on Biological Diversity." September 16, 2009, <https://www.cbd.int/convention/guide/?id=action>.

<sup>118</sup> "Zero Draft of the Post-2020 Global Biodiversity Framework ...." January 10, 2020, <https://www.cbd.int/article/2020-01-10-19-02-38>.



First of all, the preservation of the natural habitat of the remaining living organisms must be ensured. This can be achieved by tracing new locations unscathed by the wildfires and the government aiding in setting up, either by funding or through other means, such as the administration of conservation parks so the surviving species can be held in protective custody there, thus aiding in preventing population numbers decreasing to the point that endangerment or extinction of certain species would occur.<sup>119</sup> <sup>120</sup> Moreover, citizens must be encouraged to support initiatives of reforestation either financially or through other means, (e.g. [onetreeplanted.org](https://onetreeplanted.org)) in order to partly revive the damaged wilderness since a great part of it were considered major biodiversity spots prior to the fires. The regeneration of vegetation and amelioration of soil quality is also important. <sup>121</sup>

In regards to their living conditions, if vegetation due to the overpopulation in the new habitats or in the burnt areas is deficient, the provision of food must be considered as an urgent issue to be addressed (e.g. by reforestation, by aerial provision of sweet potatoes and carrots as indeed has been the case to many marsupials since the 2019 wildfires and their aftermath), as well as the cleaning of water sources which will benefit not only the growth of vegetation, but also the reassurance of the well-being of aquatic life, given that the fires contaminated numerous water sources with soot and other debris.

However, as it was previously noted, a huge biodiversity loss, specifically 1.25 billion animals perishing, has been recorded which cannot be restored. We can only replace this loss by regenerating wildlife. One way to achieve that appears to be via genetic modification, which will prove as a great opportunity to protect endangered species who are about to become extinct, or the generating of cryobanks for endangered species, with such endangerment resulting from the fire. <sup>122</sup> Furthermore, another medium to achieve regeneration of species, regarding flora, is the attraction of pollinators by sustaining an environment delectable to them. Pollinators work as

<sup>119</sup> "10 Ways to Protect and Conserve Biodiversity | Greentumble." July 2, 2018, <https://greentumble.com/10-ways-to-protect-and-serve-biodiversity/>.

<sup>120</sup> "Conservation: Preventing Biodiversity Loss | Saving Earth ...." <https://www.britannica.com/explore/savingearth/conservation-preventing-biodiversity-loss>.

<sup>121</sup> "Australia - One Tree Planted." <https://onetreeplanted.org/products/australia>.

<sup>122</sup> "Genetic modification proposed to save endangered species ...." 26 Σεπ. 2013, <https://www.theguardian.com/environment/2013/sep/26/biologists-genetic-modification-endangered-species>. Πρόσβαση στις 7 Αυγ. 2020.



fertilizers, resulting in the harvesting of fruits, vegetables, and other crops, but also the formation of seeds which become the stimulus for new plants to be created. <sup>123</sup> <sup>124</sup>

Additionally, the raising of awareness can also be really helpful if it is properly conducted. First of all, encouraging citizens to offer volunteer work regarding reforestation, work at conservation parks and protection of the surviving organisms would prove as an efficient method. Moreover, zoophilists and regular citizens have the potential to drastically aid in the protection of endangered species after the wildfires, such as by fostering such an animal (e.g. a koala through the initiative of WWF called “Adopt a Koala” <sup>125</sup>), but simpler ways exist to assist apart from volunteering, such as conserving water and reducing or eliminating the use of motor-driven vehicles, actions which put animals’ wellbeing into jeopardy through noise and air pollution, but also due to reckless driving.

However, these measures will only prove efficient if further wildfire disasters are prevented; thus compelling fire management must be applied promptly. A less known but effective method appears to be the Aboriginal Techniques or Indigenous fire methods, namely to light controlled fires in a careful way to prevent further wildfire breakouts by eliminating fuel remnants or any kind of grass that could reignite a fire. <sup>126</sup> Similar methods have been utilized in the Indigenous Fire Management of Kimberley and positive results have been recorded. Furthermore, the proper construction and more effective house design will also prevent such losses of properties as it was sadly these bushfires’ case. <sup>127</sup> Last but not least, campaigns must be organized in order to inform the citizens about the impact that wildfires have on the society and wildlife so they will be highly urged to refrain from actions that can

<sup>123</sup> "What are pollinators and why do we need them? - Penn State ...."

<https://ento.psu.edu/pollinators/resources-and-outreach/what-are-pollinators-and-why-do-we-need-them>.

<sup>124</sup> "15 Ways We Can Conserve Biodiversity Today | Schooled By ...."

<https://schooledbyscience.com/15-ways-we-can-serve-biodiversity-today/>.

<sup>125</sup> "Adopt a koala | Symbolic animal adoptions from WWF." <https://gifts.worldwildlife.org/gift-center/gifts/species-adoptions/koala.aspx>.

<sup>126</sup> "The history of fire in Australia — and how it can help us ... - ABC." February 9, 2020,

<https://www.abc.net.au/news/2020-02-10/fires-bushfires-in-australia-history-lessons-for-future/11937652>.

<sup>127</sup> "Designing Your Home to Survive Wildfires - Energy Design ...." <http://www.energy-design-tools.aud.ucla.edu/FIRES.html>.



easily cause a firespot e.g. starting campfires and leaving them unattended, throwing of lit cigarettes in rural areas e.t.c. <sup>128</sup>

## Bibliography

1. "AMELIORATION | meaning in the Cambridge English Dictionary." <https://dictionary.cambridge.org/dictionary/english/amelioration>.
  2. "wildfire | Definition & Facts | Britannica." <https://www.britannica.com/science/wildfire>.
  3. "Wildfire | Definition of Wildfire by Merriam-Webster." <https://www.merriam-webster.com/dictionary/wildfire>.
  4. "Bushfire - ScienceDaily." <https://www.sciencedaily.com/terms/bushfire.htm>.
  5. "Bushfire | Geoscience Australia." <https://www.ga.gov.au/scientific-topics/community-safety/bushfire>.
  6. "BUSHFIRE | meaning in the Cambridge English Dictionary." July 8, 2020, <https://dictionary.cambridge.org/dictionary/english/bushfire>.
  7. "flora noun - Oxford Learner's Dictionaries." [https://www.oxfordlearnersdictionaries.com/definition/american\\_english/flora](https://www.oxfordlearnersdictionaries.com/definition/american_english/flora).
  8. "Fauna: Definition, History and Examples | Biology Dictionary." May 20, 2018, <https://biologydictionary.net/fauna/>.
  9. "Biodiversity | National Geographic Society." August 8, 2019, <https://www.nationalgeographic.org/encyclopedia/biodiversity/>.
  10. "biodiversity noun - Definition, pictures, pronunciation and ...." <https://www.oxfordlearnersdictionaries.com/definition/english/biodiversity>.
  11. "Biodiversity Hotspots | National Geographic Society." April 19, 2019, <https://www.nationalgeographic.org/encyclopedia/biodiversity-hotspots/>.
  12. "Biodiversity hotspots defined | CEPF." <https://www.cepf.net/our-work/biodiversity-hotspots/hotspots-defined>.
  13. "Positive Indian Ocean Dipole fuels bushfires devastating ...." December 11, 2019, <https://www.abc.net.au/news/2019-12-11/indian-ocean-dipole-fuels-dry-australia-bushfires-africa-rain/11787874>.
  14. "Dry Lightning - WFAS." <https://www.wfas.net/index.php/dry-lightning-experimental-products-97>.
  15. "What are pyrocumulus clouds? | The Weather Guys." June 11, 2012, <https://wxguys.ssec.wisc.edu/2012/06/11/what-are-pyrocumulus-clouds/>.
  16. "About Pollinators | Pollinator.org." <https://www.pollinator.org/pollinators>.
  17. "What are pollinators and why do we need them? — Center for ...." <https://ento.psu.edu/pollinators/resources-and-outreach/what-are-pollinators-and-why-do-we-need-them>.
- <sup>128</sup> "Indigenous Fire Management — Kimberley Land Council." <https://www.klc.org.au/indigenous-fire-management>.





18. "Bushfire - Black Saturday, Victoria, 2009." February 15, 2009, <https://knowledge.aidr.org.au/resources/bushfire-black-saturday-victoria-2009/>.
19. "Black Saturday bushfires | National Museum of Australia." <https://www.nma.gov.au/defining-moments/resources/black-saturday-bushfires>.
20. "Black Saturday - Forests after the fires - Victorian National ...." April 4, 2019, <https://vnpa.org.au/black-saturday-forests-after-the-fires/>.
21. "Ash Wednesday Bushfire - VIC/SA 1983 | Australian Disasters." <https://knowledge.aidr.org.au/resources/bushfire-ash-wednesday-1983/>.
22. "Ash Wednesday bushfires: February 16, 1983 - ABC ...." February 14, 2013, <https://www.abc.net.au/news/emergency/2013-02-14/ash-wednesday-bushfires-1983-from-the-archives/4519214>.
23. "On this day: Ash Wednesday bushfires - Australian Geographic." <https://www.australiangeographic.com.au/blogs/on-this-day/2013/11/on-this-day-ash-wednesday-bushfires/>.
24. "On this day: Ash Wednesday bushfires - Australian Geographic." <https://www.australiangeographic.com.au/blogs/on-this-day/2013/11/on-this-day-ash-wednesday-bushfires/>.
25. "Black Thursday - Australian Disaster Resilience Knowledge Hub." <https://knowledge.aidr.org.au/resources/bushfire-black-thursday-1851/>.
26. "1851 - Bushfires in Victoria - Research Guides at State Library ...." June 19, 2020, <https://guides.slv.vic.gov.au/bushfires/1851>.
27. "'Black Thursday' Bushfires 1851." <https://portphillippioneersgroup.org.au/pppg5df.htm>.
28. "Black Friday bushfires, VIC 1939 | Australian Disasters." <https://knowledge.aidr.org.au/resources/bushfire-black-friday-victoria-1939/>.
29. "'Black Friday' bushfires | Environment & Society Portal." <http://www.environmentandsociety.org/tools/keywords/black-friday-bushfires>.
30. "Black Friday 1939 - Forest Fire Management Victoria." June 10, 2017, <https://www.ffm.vic.gov.au/history-and-incidents/black-friday-1939>.
31. "Black Friday: The day a 'ring of bushfires' devastated Victoria." January 13, 2020, <https://thenewdaily.com.au/news/2020/01/13/bushfires-victoria-black-friday/>.
32. "Australia fires: 8 things everyone should know about the ... - Vox." January 22, 2020, <https://www.vox.com/science-and-health/2020/1/8/21055228/australia-fires-map-animals-koalas-wildlife-smoke-donate>.
33. "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.
34. "Climate Change Affected Australia's Wildfires, Scientists Confirm." March 4, 2020, <https://www.nytimes.com/2020/03/04/climate/australia-wildfires-climate-change.html>.
35. "Australia wildfires: communities must stay vigilant ... - UN News." November 12, 2019, <https://news.un.org/en/story/2019/11/1051131>.
36. "Australia Bushfires: Cause, Impact, and Restoration | One ...." <https://onetreeplanted.org/blogs/stories/australia-bushfires>.
37. "Australia wildfires: communities must stay vigilant ... - UN News." November 12, 2019, <https://news.un.org/en/story/2019/11/1051131>.



38. "Fires in Australia: Bushfires are creating ... - CBS News." December 30, 2019, <https://www.cbsnews.com/news/fires-in-australia-pyrocumulonimbus-thunderstorm-clouds-victoria-sydney/>.
39. "Australia wildfires: Here's what you need to know ... - CNN.com." January 13, 2020, <https://www.cnn.com/2020/01/01/australia/australia-fires-explainer-intl-hnk-scli/index.html>.
40. "2019-2020 Australian Bushfires - Center for ...." September 9, 2019, <https://disasterphilanthropy.org/disaster/2019-australian-wildfires/>.
41. "Australia fires: A visual guide to the bushfire crisis - BBC News." <https://www.bbc.com/news/world-australia-50951043>.
42. "Australian bushfires: A timeline of what's happened so far ...." <https://www.createdigital.org.au/australian-bushfires-a-timeline-of-whats-happened-so-far/>.
43. "When and how the Australia bushfires started in 2019 - Insider." January 8, 2020, <https://www.insider.com/when-how-australia-bushfires-started-in-2019-2020-1>.
44. "Morrison's government on the bushfires: from attacking climate ...." January 4, 2020, <https://www.theguardian.com/australia-news/2020/jan/04/morrison-s-government-on-the-bushfires-from-attacking-climate-lunatics-to-calling-in-the-troops>.
45. "What you need to know about the Australia bushfires - The ...." February 13, 2020, <https://www.theverge.com/2020/1/3/21048891/australia-wildfires-koalas-climate-change-bushfires-deaths-animals-damage>.
46. "Australia fires: Troops called to tackle fires - BBC ... - BBC.com." <https://www.bbc.com/news/world-australia-50986363>.
47. "Australian Bushfires - WWF-Australia - WWF-Australia." <https://www.wwf.org.au/what-we-do/bushfires>.
48. "How the Bushfires Threaten Australians' Mental Health | Time." January 8, 2020, <https://time.com/5759685/australian-bushfires-mental-health/>.
49. "Ten impacts of the Australian bushfires - UN Environment ...." January 22, 2020, <https://www.unenvironment.org/news-and-stories/story/ten-impacts-australian-bushfires>
50. "Australia wildfires unleash millions of tons of carbon dioxide." January 22, 2020, <https://www.nbcnews.com/science/environment/australia-wildfires-unleash-millions-tons-carbon-dioxide-n1120186>.
51. "Bushfires Devastate Australian Biodiversity, with Species ...." January 9, 2020, <https://theenergymix.com/2020/01/09/bushfires-devastate-australian-biodiversity-with-species-extinction-likely/>.
52. "Millions of animals are dying from the Australian wildfires - CNN." January 8, 2020, <https://www.cnn.com/2020/01/07/australia/australia-fire-wildlife-deaths-intl-hnk-scli/index.html>.
53. "Australia fires: Why species might go extinct, explained ... - Vox." January 10, 2020, <https://www.vox.com/energy-and-environment/2020/1/9/21057375/australia-fire-wildlife-extinctions-ecology>.
54. "Bushfires Devastate Australian Biodiversity, with Species ...." January 9, 2020, <https://theenergymix.com/2020/01/09/bushfires-devastate-australian-biodiversity-with-species-extinction-likely/>.
55. "U.S. sends firefighters to Australia to help fight blazes ...." January 7, 2020, <https://share.america.gov/u-s-sends-firefighters-to-australia-to-help-fight-blazes/>.



56. "Australia fires: How the world has responded to the crisis - BBC." January 6, 2020, <https://www.bbc.com/news/world-australia-51024904>.
57. "Australia bushfires: What countries have offered international ...." January 6, 2020, <https://www.euronews.com/2020/01/06/australia-bushfires-what-countries-have-offered-international-aid>.
58. "firefighting efforts in Australia. - National Interagency Fire Center." March 3, 2020, [https://www.nifc.gov/fireInfo/fireInfo\\_australia.htm](https://www.nifc.gov/fireInfo/fireInfo_australia.htm).
59. "These American firefighters are heading to Australia to help ...." January 7, 2020, <https://www.actionnewsnow.com/content/news/566779082.html>.
60. "U.S. sends more than 100 firefighters to help Australia battle ...." January 2, 2020, <https://www.latimes.com/world-nation/story/2020-01-02/la-me-australia-fires-us-helps-firefighters>.
61. "Australia bushfires: New Zealand Defence Force sending ...." January 5, 2020, <https://www.newshub.co.nz/home/politics/2020/01/australia-bushfires-new-zealand-defence-force-sending-support-to-australia.html>.
62. "New Zealand sends troops to help with Australian bushfires as ...." January 6, 2020, <https://www.theguardian.com/australia-news/2020/jan/06/new-zealand-sends-troops-to-help-with-australian-bushfires-as-pacific-nations-offer-support>.
63. "Australia fires: PNG offers military support | RNZ News." January 6, 2020, <https://www.rnz.co.nz/news/pacific/406756/australia-fires-png-offers-military-support>.
64. "Australia fires: PNG to send 100 soldiers | RNZ News." January 10, 2020, <https://www.rnz.co.nz/international/pacific-news/407028/australia-fires-png-to-send-100-soldiers>.
65. "Pacific nations Vanuatu and PNG pledge aid for Australia's ...." January 6, 2020, <https://www.abc.net.au/news/2020-01-06/pacific-nations-pledge-aid-for-australias-bushfires/11844008>.
66. "VANUATU ASSISTS AUSTRALIA | News | dailypost.vu." January 6, 2020, [https://dailypost.vu/news/vanuatu-assists-australia/article\\_1b5c3a12-3002-11ea-84d5-df559b895c14.html](https://dailypost.vu/news/vanuatu-assists-australia/article_1b5c3a12-3002-11ea-84d5-df559b895c14.html).
67. "Pacific nations Vanuatu and PNG pledge aid for Australia's ...." January 6, 2020, <https://www.abc.net.au/news/2020-01-06/pacific-nations-pledge-aid-for-australias-bushfires/11844008>.
68. "77 Canadians on their way to help Australia as ... - Global News." January 16, 2020, <https://globalnews.ca/news/6423641/77-canadian-fire-fighters-australia/>.
69. "5 French experts in Australia to provide assistance in the ...." February 27, 2020, <https://au.ambafrance.org/5-French-experts-in-Australia-to-provide-assistance-in-the-bushfires-crisis>.
70. "Team of UK experts to help fight Australian bushfires - GOV.UK." January 9, 2020, <https://www.gov.uk/government/news/team-of-uk-experts-to-help-fight-australian-bushfires>.
71. "Burning the fire continent - AWC - Australian Wildlife ...." May 15, 2020, <https://www.australianwildlife.org/burning-the-fire-continent/>.
72. "About Us - Wildlife Victoria." <https://www.wildlifelifevictoria.org.au/about/about-us>.
73. "Helping wildlife during bushfires - Wildlife Victoria." <https://www.wildlifelifevictoria.org.au/?view=article&id=145:helping-wildlife-during-bushfires&catid=11:wildlife-information>
74. "Starving, thirsty Australian wildlife on NSW south coast ... - ABC." February 1, 2020, <https://www.abc.net.au/news/2020-02-02/starving-thirsty-australian-wildlife-on-nsw-south-coast/11916690>.



75. "Mogo Zoo: NSW bushfires, Clyde Mountain fire threatens ...." December 30, 2019, <https://www.news.com.au/technology/environment/heroic-job-mogo-zoo-staff-protect-animals-threatened-by-outofcontrol-new-south-wales-fire/news-story/af04d00faf13063f233a78cb472fd9cf>.
76. "Australia bushfire crews battle mega blaze near Snowy ... - BBC." January 10, 2020, <https://www.bbc.com/news/world-australia-51052042>.
77. "Wildlife loss in Australia much bigger than it appears." January 16, 2020, <https://www.aa.com.tr/en/environment/wildlife-loss-in-australia-much-bigger-than-it-appears/1704885>.
78. "Australian bushfires: A timeline of what's happened so far ...." <https://www.createdigital.org.au/australian-bushfires-a-timeline-of-whats-happened-so-far/>.
79. "Bushfire Relief and Recovery - Australian High Commission." <https://uk.embassy.gov.au/hlh/bushfirerecovery.html>.
80. "Australia's Strategy for Nature 2019-2030 | Australia's Nature ...." <https://www.australiasnaturehub.gov.au/national-strategy>.
81. "Australia's Biodiversity Conservation Strategy 2010-2030 - PDF." <https://library.dbca.wa.gov.au/static/FullTextFiles/070234.pdf>.
82. "Environment Protection and Biodiversity Conservation Act 1999." [http://extwprlegs1.fao.org/docs/pdf/aus17072\\_Volume1.pdf](http://extwprlegs1.fao.org/docs/pdf/aus17072_Volume1.pdf).
83. "Sustaining Life on Earth - Convention on Biological Diversity." September 16, 2009, <https://www.cbd.int/convention/guide/?id=action>.
84. "Zero Draft of the Post-2020 Global Biodiversity Framework ...." January 10, 2020, <https://www.cbd.int/article/2020-01-10-19-02-38>.
85. "Defence Personnel | legal definition of Defence ... - Law Insider." <https://www.lawinsider.com/dictionary/defence-personnel>.
86. "Australia - BBC News - BBC.com." <https://www.bbc.com/news/world/australia>.
87. "Australian bushfires partly due to late monsoon ending in ...." November 11, 2019 <https://economictimes.indiatimes.com/news/international/world-news/australian-bushfires-partly-due-to-late-monsoon-ending-in-india-expert/articleshow/72002412.cms>.
88. "The Daily Telegraph (Sydney): 2019-11-11 ... - PressReader." November 11, 2019 <https://www.pressreader.com/australia/the-daily-telegraph-sydney/20191111/281599537317349>.
89. "Adopt a koala | Symbolic animal adoptions from WWF." <https://gifts.worldwildlife.org/gift-center/gifts/species-adoptions/koala.aspx>.
90. "15 Ways We Can Conserve Biodiversity Today | Schooled By ...." <https://schooledbyscience.com/15-ways-we-can-protect-biodiversity-today/>.
91. "Designing Your Home to Survive Wildfires - Energy Design ...." <http://www.energy-design-tools.aud.ucla.edu/FIRES.html>.
92. "10 Ways to Protect and Conserve Biodiversity | Greentumble." July 2, 2018, <https://greentumble.com/10-ways-to-protect-and-conserve-biodiversity/>.
93. "Conservation: Preventing Biodiversity Loss | Saving Earth ...." <https://www.britannica.com/explore/savingearth/conservation-preventing-biodiversity-loss>.
94. "Canada stands ready to assist Australia in fighting raging ...." 13 Nov. 2019, <https://www.rcinet.ca/en/2019/11/13/canada-stands-ready-to-assist-australia-in-fighting-raging-wildfires/>.

