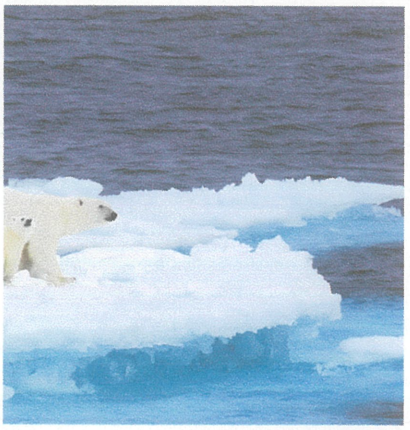
# CLIMATE CHANGE


CLIMATE CHANGE
"THIS IS THE BIGGEST CRISIS HUMANITY HAS EVER FACED. THIS IS NOT SOMETHING YOU CAN LIKE ON FACEBOOK ..."
- GRETA THUNBURG

# CONTENTS





# Boiling point; melting point

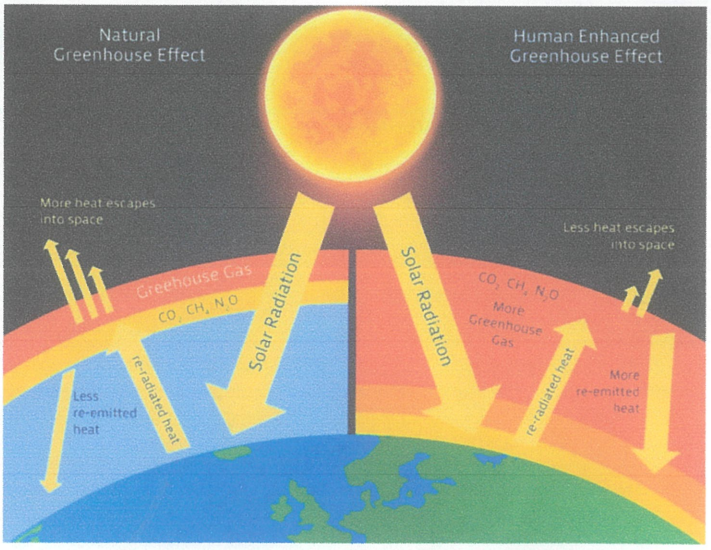
## What is climate change?

Although it doesn't come as a shock to many of us that our world is currently facing one of humanities most threatening crisis's, the everlasting effects of climate change are irreversible, inevitable, and indisputably an adaptation our world is simply not prepared to face head on. For many global issues, we can often draw conclusions and make exemptions for those whose actions have wreaked havoc on the entirety of our environment, economy, but more importantly – our individual livelihoods. However, climate change is no longer a "doomsday prophecy, it's a reality."

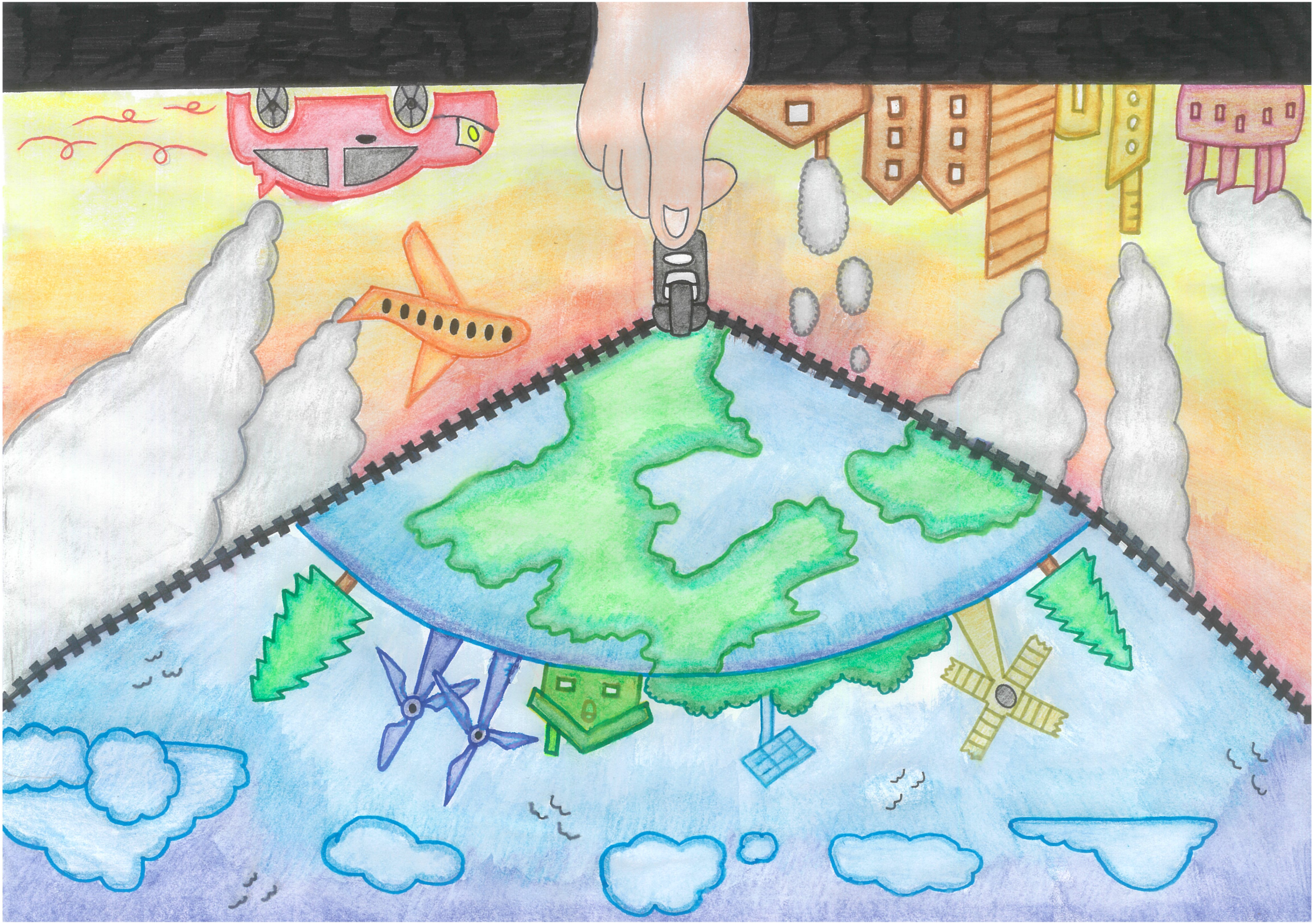

As human beings, we are vulnerable to confusing the that climate is un-selective; whether you are rich or poor, black or white, big or small - you are guaranteed to succumb to the effects of climate change if global solidarity is not reached.

Climate change, or also known more recently as the *"climate crisis"*, is a broad term that encompasses many different factors. Generally, climate change is a term used to describe long term shifts in global or regional climate patterns. As mentioned, these changes often have a broad range of observed effects that are synonymous with the term. Although the majority of our world now refers to climate change as the 'climate crisis', this wasn't always the case. The terminology by which climate change is referred to as, has immensely changed over the past fifty years. It begun as the 'global warming' phenomenon, which referred to the long-term heating of Earth's climate system observed since the pre-industrial period (between 1850 and 1900) due to the age of the 'Anthropocene', where human activity observed rising levels of greenhouse gas emissions. As scientists were able to research in greater amounts just how severe and to what extent the climate was changing (both heating and freezing – extremes from polar opposites of the general climate), global warming was changed to 'climate change'.

Once a term was defined and declared as immutable, greater research could be conducted into the future of our planet with climate change being inevitably evident. Despite climate change being significantly aligned with greenhouse gases (atmospheric concentrations of $C0_2$ – carbon dioxide) gases such as methane ($CH_4$) and nitrous oxide ($N_20$) which are all human generated, tend to enhance the natural greenhouse effect in a vastly different way [see diagram below]. However, although these gases are far more detrimental to the environment, they are produced at a much more minute rate, and therefore do not have as much of an impact.



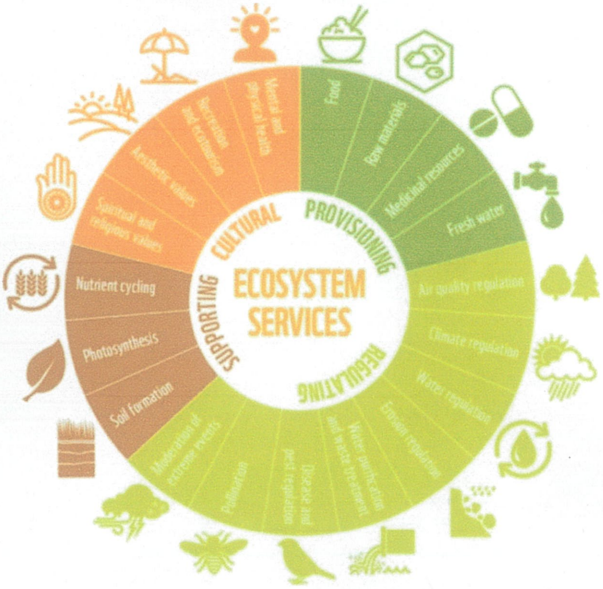

In the diagram located to the left, we are reviewing the comparison between the natural greenhouse effect compared to the human enhanced greenhouse effect. It is clearly evident that before analysing the graph any further, that the human enhanced greenhouse effect is a greater detriment to our world than the natural greenhouse effect. Both sides of the diagram contain solar radiation from the sun, however only the human enhanced greenhouse effect is unable to release as much heat into space as the natural effect can, due to the amount of greenhouse gases covering the outer layer of the earth. As a result, more re-emitted heat is able to be absorbed back into earth, provoking 'freak' weather events to occur, such as bushfires and floods – at a more regulated rate.



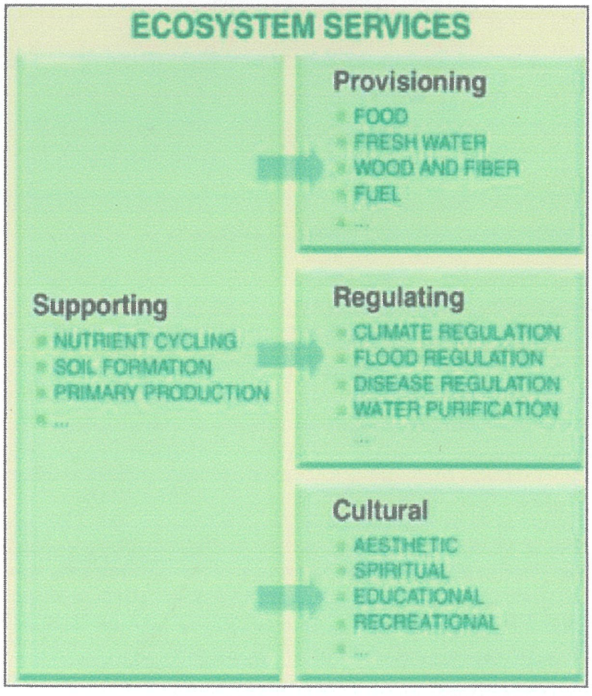
# Our Ecosystem Services

**Just how much are we willing to risk for our economy but at the expense of our earth?**

The rapid anthropogenic climate change that is being experienced presently (in other words the early twenty-first century) is intimately entwined with the health and functioning of the biosphere. Climate change is impacting ecosystems through changes in mean conditions and in climate variability, coupled with other associated changes such as increased ocean acidification and atmospheric carbon dioxide concentrations. When focusing upon the effects of climate change on various ecosystems throughout the world, the term "ecosystem services" (the conditions and processes through which natural ecosystems, and the species that make them up, sustain, and fulfil human life) is applied. Ecosystem services are derived of numerous resources and processes that in both direct and indirect ways benefit the human wellbeing. In the diagram below (labelled "ecosystem services") we can identify the four different categories that comprise of: cultural, provisioning, regulating, and supporting. As climate change is becoming increasingly impending, our ecosystems and level of biodiversity is unravelling, thus resulting in our ecosystem services becoming scarcer. The urgency to understand the 'ecological dynamics' with regard to climate change is growing progressively imperative, in order to identify areas of vulnerability, or where changes such as degradation, defaunation, and fragmentation are transpiring.




Ecosystem services profoundly affect the way in which almost all aspects of life operate. They form the basis of our lives, as without them, functionality of the world would simply become nothing but a burden. Whether this be in the form of providing adequate food and water to sustain life, or to nurture us from within, these services and conditions from the natural environment are critical aspects of all our lives. Biodiversity underlies all ecosystem services.




As illustrated in the diagram to the left, there are four main ecosystem services. Each service fulfils various specified roles, according to its desired field. The four categories of ecosystem services and their roles go by the following:

**Supporting:** The underlying natural processes that sustain all ecosystems and maintain a diversity of living organisms.

**Provisioning:** Any benefit that can be extracted directly from nature to satisfy the needs of someone both physically and mentally.

**Regulating: The** natural process within ecosystems that play a role in moderating aspects of our environment and ecosystems.

**Cultural:** The non-material benefits that people gain from ecosystems which contributes to a sense of belonging/place, as well as maintains a sense of cohesion in order to sustain a healthy mindset and well-being; essential aspects for preserving human health.

# Ecosystem Services

# The Carbon Budget

**What is classified as too much or too little?**

The carbon budget is the cumulative amount of carbon dioxide ($CO_2$) emissions permitted over a period of time to keep within a certain temperature threshold. In 2015, by signing up to the 'Paris Agreement' on climate change, nearly every country pledged to keep global temperatures "well below" 2◦C above pre-industrial levels and to "pursue efforts to limit the temperature increase even further to 1.5◦C". However, this pledge to maintain global temperatures below 2◦C was soon discovered to be far more challenging than first anticipated.

As a concept explicitly aimed at mediating between scientific knowledge and policymaking, the carbon budget has always been actively positioned in relation to ongoing policy debates, but the specific forms this concept has taken have varied. In the span of about ten years, the idea of a global "carbon budget" has become firmly established as a central concept in climate science and political establishments. The concept is based on the ability to quantify the amount of carbon that can be emitted into the atmosphere before the global temperature rise can be expected to exceed a given limit. The new carbon budget limit has been widely publicised due to much discussion between scientists and politicians as to exactly how high or how low the budget should be set at – taking into careful consideration the research that had been conducted prior. Despite the budget being set at 2◦C, we have already burned through 52% of this, emitting 515 PgC ("carbon stocks" or "carbon cycle") since the industrial revolution (1861 – 1880).

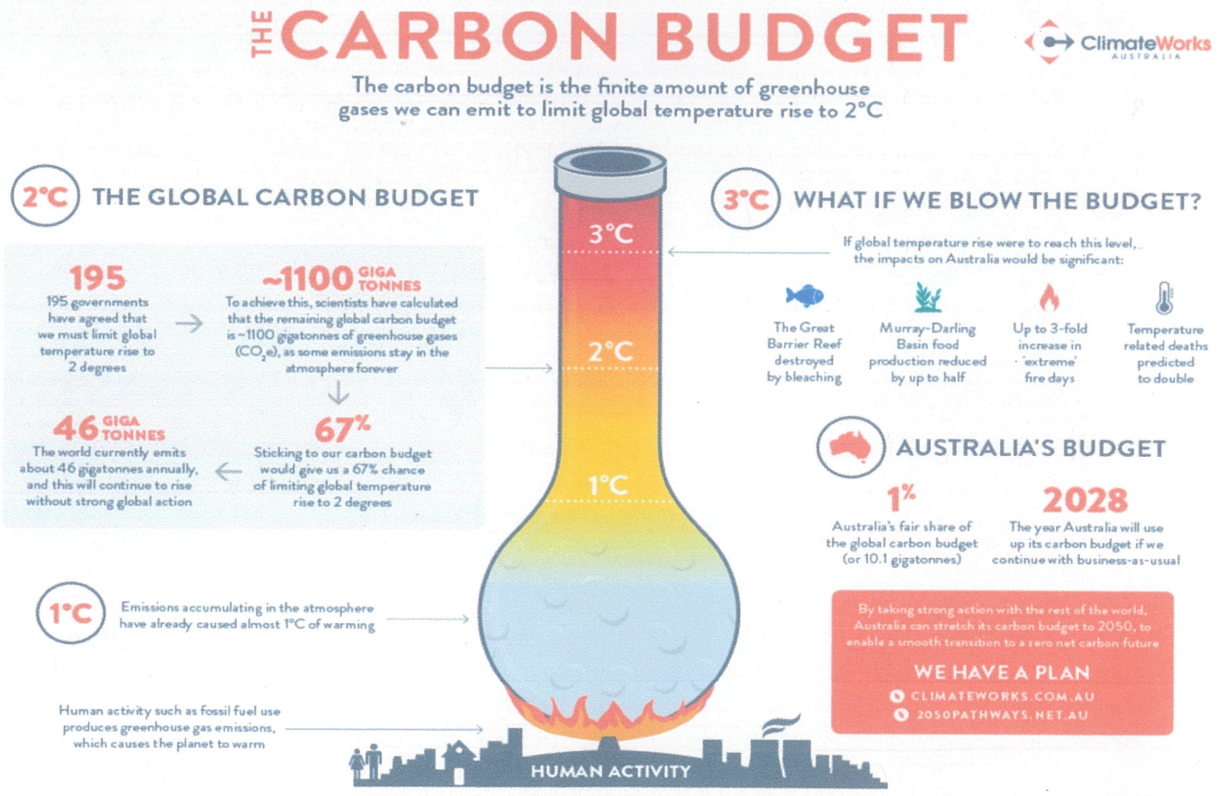
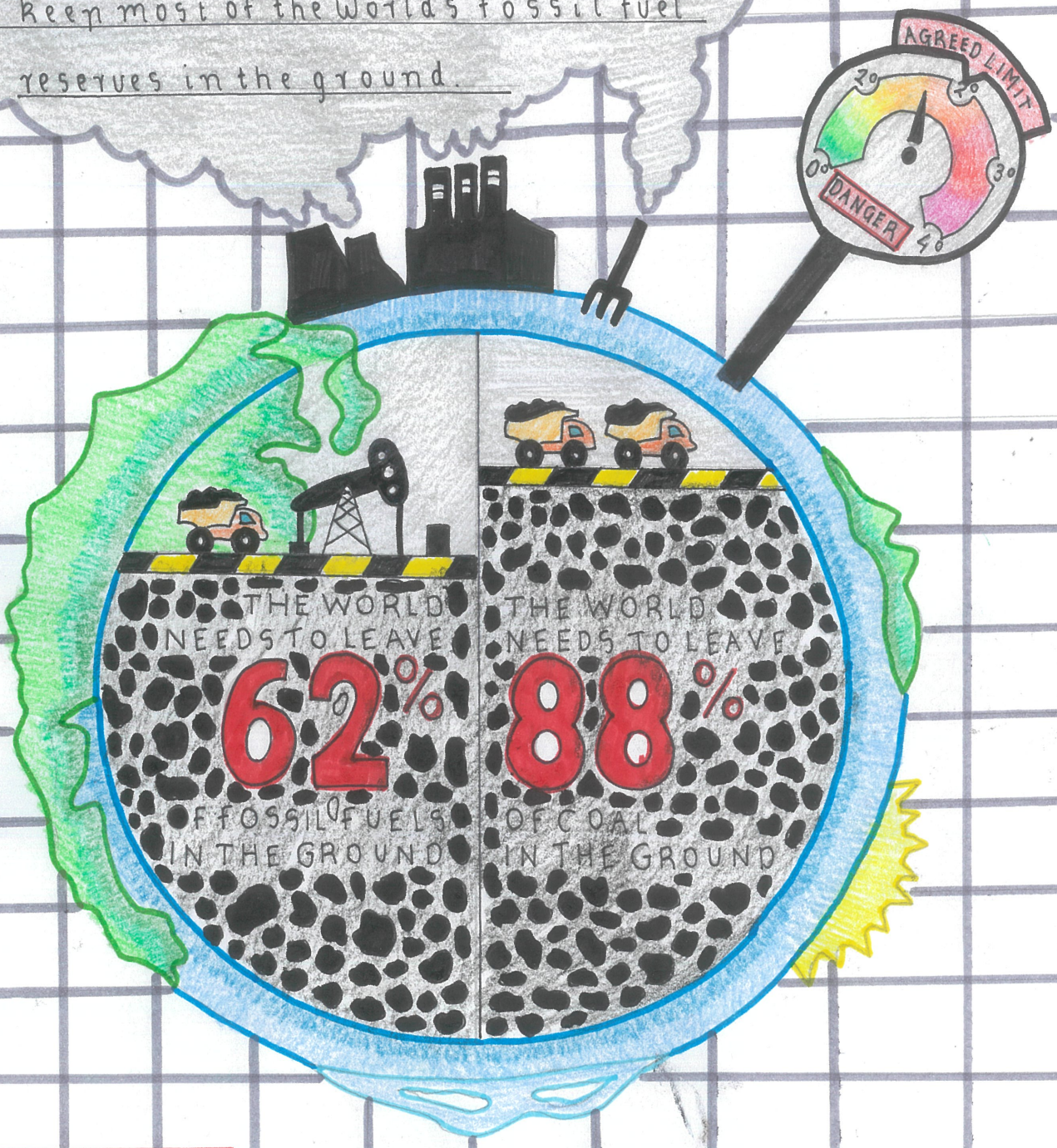



**Image:** 'The Carbon Budget' Infographic. In the infographic above, we are viewing the basis of the carbon budget - with the inclusion of factors such as "the global and Australian carbon budget", and "what if we blow the budget?". The infographic is set in a way that illustrates the various degrees by which the budget aims to follow (shown by the flask in the middle of the page). From here, arrows extend out from both the 2◦C and 3◦C indicated levels, where corresponding subheadings (outlined above) are discussed. Although not experienced currently, the infographic also includes information regarding the consequences of reaching 1◦C (despite already having supposed this) as well as how human activity has become the main 'catalyst' towards climate change.

# WHAT IS OUR CARBON BUDGET?

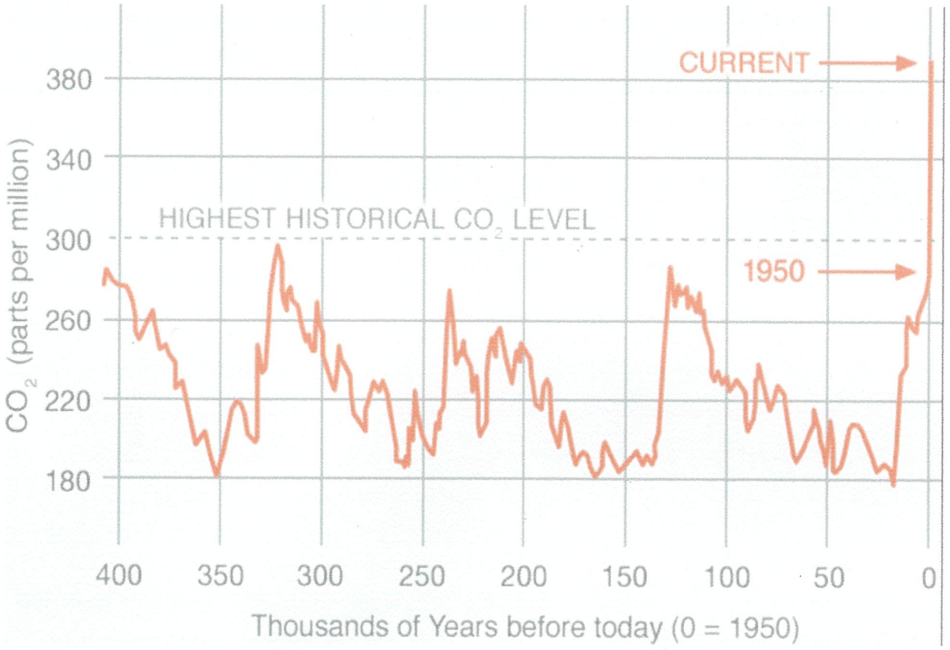
To have just a break-even, 50:50 chance of staying below 2°C of global warming, we must keep most of the world's fossil fuel reserves in the ground.




## AT THE CURRENT RATE

We will blow our carbon budget within the next two decades or even sooner.

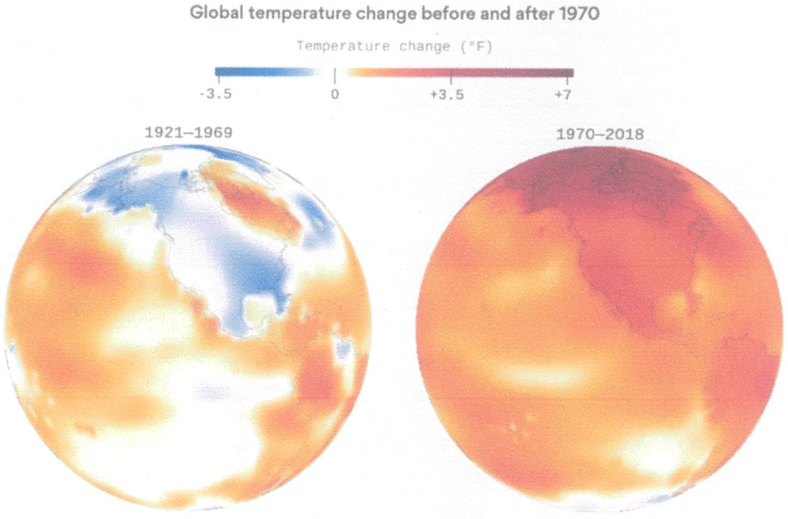
# Climate Change Map/Graph Analysis




The projections seen before 1950 may be due to natural variations in the climate where weather patterns may have been disrupted by natural disasters, such as volcanic eruptions or floods. This line graph shows that before 1950, millennia had never surpassed 300 parts per million atmospheric carbon dioxide in the atmosphere - until 1950, where rates of $CO_2$ emissions increased to 425 parts per million, the current level of $CO_2$ in our atmosphere. Currently however, our atmosphere contains over 380 parts per millions of $CO_2$ in the atmosphere, the highest rates that have ever been experienced in the whole of humanity.

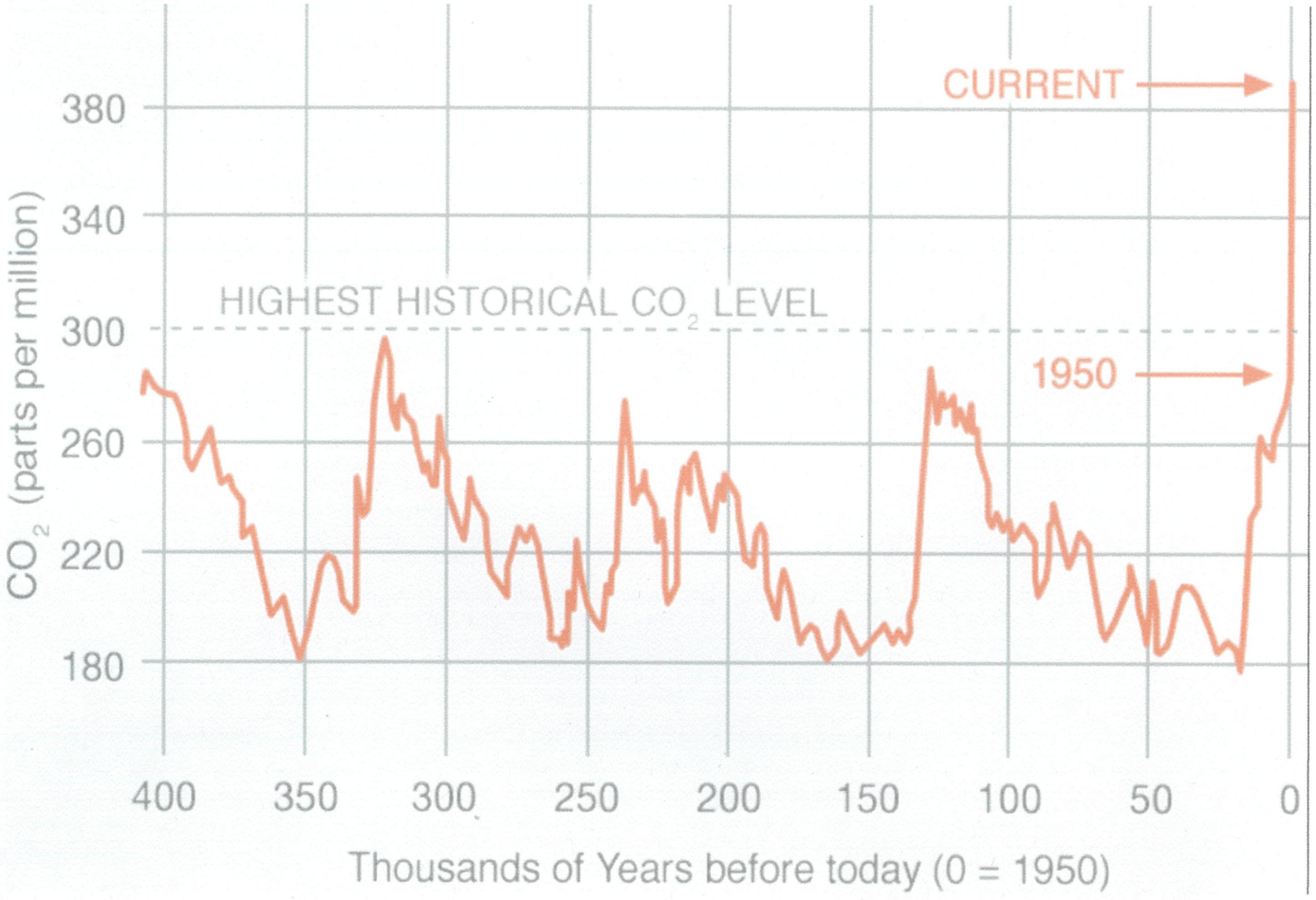
In the line graph on the left, we are viewing the amount of carbon dioxide ($CO_2$) in the atmosphere before 1950. Although the entirety of the graph is mostly straightforward (despite a few projections before 1950), the 'stand-out' piece of data is the 'current' carbon dioxide levels in the atmosphere.

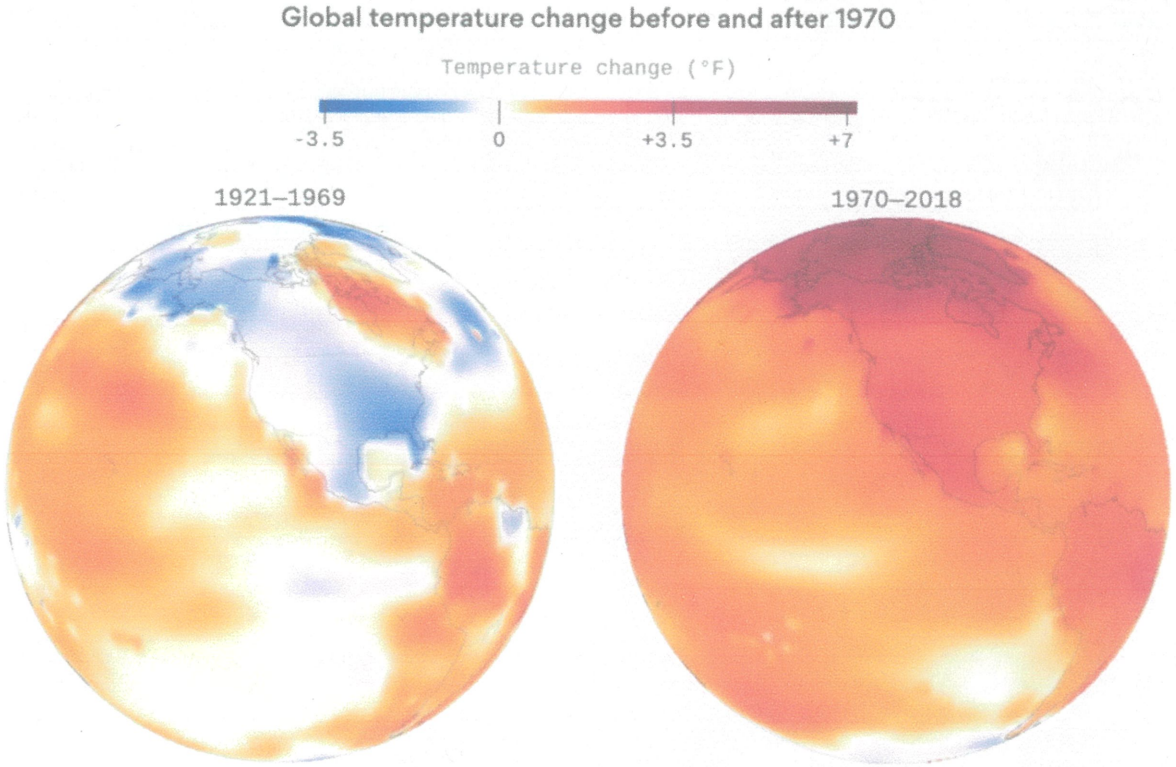
In the graph on the right, we are viewing two contrasting globes of the world (displaying the same countries) which highlight how climate change has effected the overall temperature of the earth, and how this has increased and decreased over time. The first globe displays the temperature of the earth over the time period of 1921-1969. Between this time, the temperature of the earth had never surpassed 2.2 degrees (Fahrenheit), but had fallen below -3.5 degrees. In the second globe however, (with a time period of 1970-2018) it is clearly evident that the temperature had risen quite substantially, especially compared to the first globes findings. Temperatures on the second globe had never fallen below 0 degrees, but had surpassed +7 degrees. One similarly that can be identified between both graphs,




are the areas which may have been darker on one globe, have continued to become darker on the second. An example of this would be countries such as North America (upper) and South America (lower) that held the highest temperatures on the first globe, have continued to maintain high temperatures on the second globe.

# Enlarged Graphs



# What are the causes of climate change?

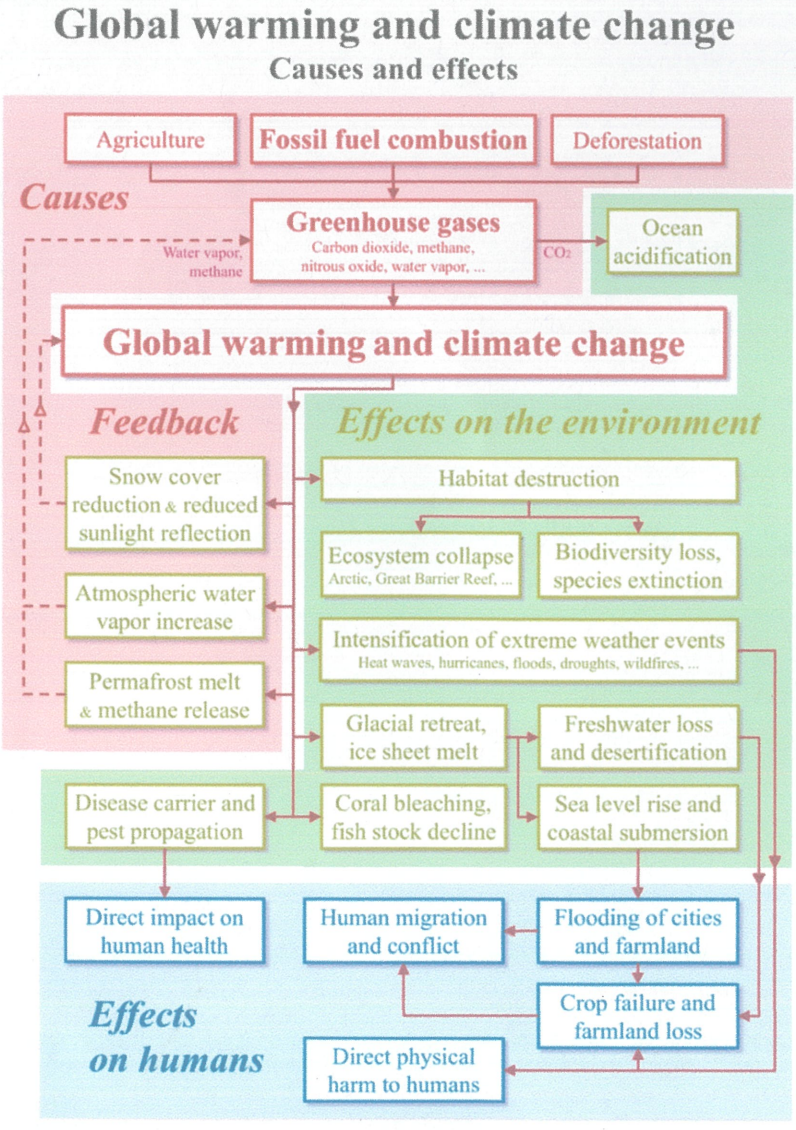
The causes of climate change vary quite substantially. Human alterations as well as natural modifications both heavily effect the severity and rate that climate change occurs. However, there is one outrider that exceeds $CO_2$ emissions far beyond the rest; and this is the 'greenhouse gas effect'. As discussed previously, the 'greenhouse gas effect' (specifically the human greenhouse gas effect) is caused by the burning of excessive amounts of fossil fuels (such as coal) for electricity, heat, and transportation. Approximately 62 percent of our electricity comes from burning fossil fuels, mostly coal and natural gas. Although emissions of fossil fuels are one of the leading causes of climate change, there are also many other factors that contribute greatly to this threatening issue. The following also rank quite highly in terms of the main contributors towards the climate crisis:

**Deforestation (human implemented):** because living trees absorb and store carbon dioxide – subsequently, when they are cut down the stored $CO_2$ is emitted into the atmosphere.

**Orbital changes (natural cause):** the effect on climate of slow changes in the tilt of the Earth's axis and shape of the Earth's orbit around the sun. Therefore, the more uniform Earth's orbit is (more like a perfect circle), the less difference there is in climate change throughout the year.

**Increasingly intensive agriculture (human implemented):** which emits greenhouse gases like methane and nitrous oxide.

**Solar variations (natural cause): the** change in the sun's radiation output. The resulting imbalance between incoming solar radiation and outgoing thermal radiation will likely contribute greatly towards to climate crisis.




In the graph located on the left, we are viewing a diagram of climate change – including the causes and effects. The diagram is set up in a way that displays the various different sectors (specifically climate change's effect on the environment, humans, as well as general causes which lie in between) surrounding the general effects of climate change. In relation to what is written above, we can identify similar key ideas by analysing the diagram. The red sector displays the general and key contributors towards the climate crisis as well as feedback from the ideas discussed, the green sector displays the effects of climate change on the environment, specifically focussing upon habitat destruction, and lastly, the blue sector focuses upon climate changes effect on humans, these ideas interlocking with previous statements made by contrasting sectors.

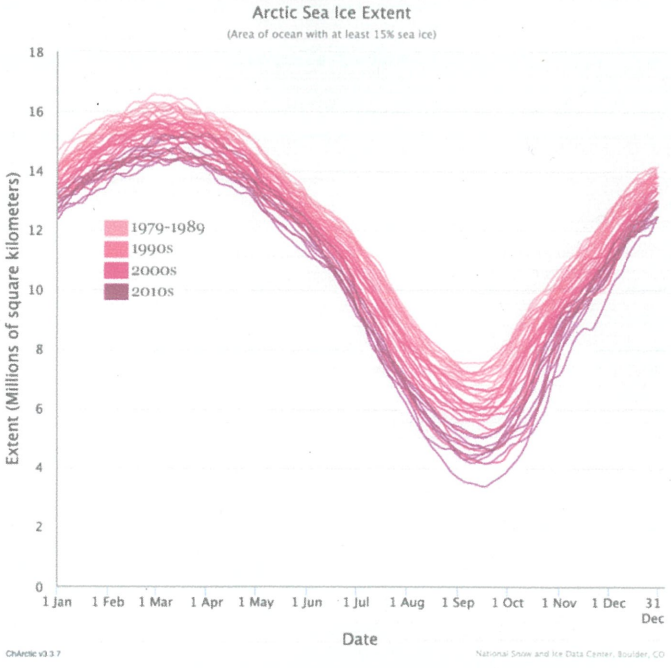
# Impact 1: Bushfires

One of the many, but most evident impacts of climate change our world is currently combatting, are bushfires, or also commonly referred to as wildfires. Although everyone once in a while bushfires are inevitable, we are observing rapid increases in the amount of bushfires that occur every year, as well as the expected fire seasons getting longer, and becoming more frequent. This is due to climate change – an issue that not only pertains to the heating of the climate, but also the cooling. Unlike many other impacts caused by climate change, bushfires are particularly complex to understand – as fire in itself, is extremely unpredictable. There are four underlying impacts that climate change has had upon the environment, that also lead to an increase in wildfires. These are: A longer fire season, hotter temperatures, drier vegetation and 'fuel', and lastly more lightning.


Climate change has increased the hot, dry weather, that is associated with risk of greater bushfires. In a recent study conducted by the 'World Weather Attribution consortium' it was revealed that climate change has possibly boosted the risk of bushfires by an astounding 30% - but also suggests the figure is likely to be much greater. The burning of coal, oil and gas is driving up global temperatures, causing a hotter climate in Australia as well as the overall global conditions and climate. Since the mid-1990s, southeast Australia has experienced a 15% decline in late autumn and early winter rainfall and a 25% decline in average rainfall in April and May. Across Australia average temperature has increased leading to more record breaking hot weather. Extreme fire danger days have increased. The visual created by 'The Australian Institute' has concluded that 76% of Australians are concerned about climate change resulting in more bushfires, further validating the research and studies conducted in impacts of climate change.

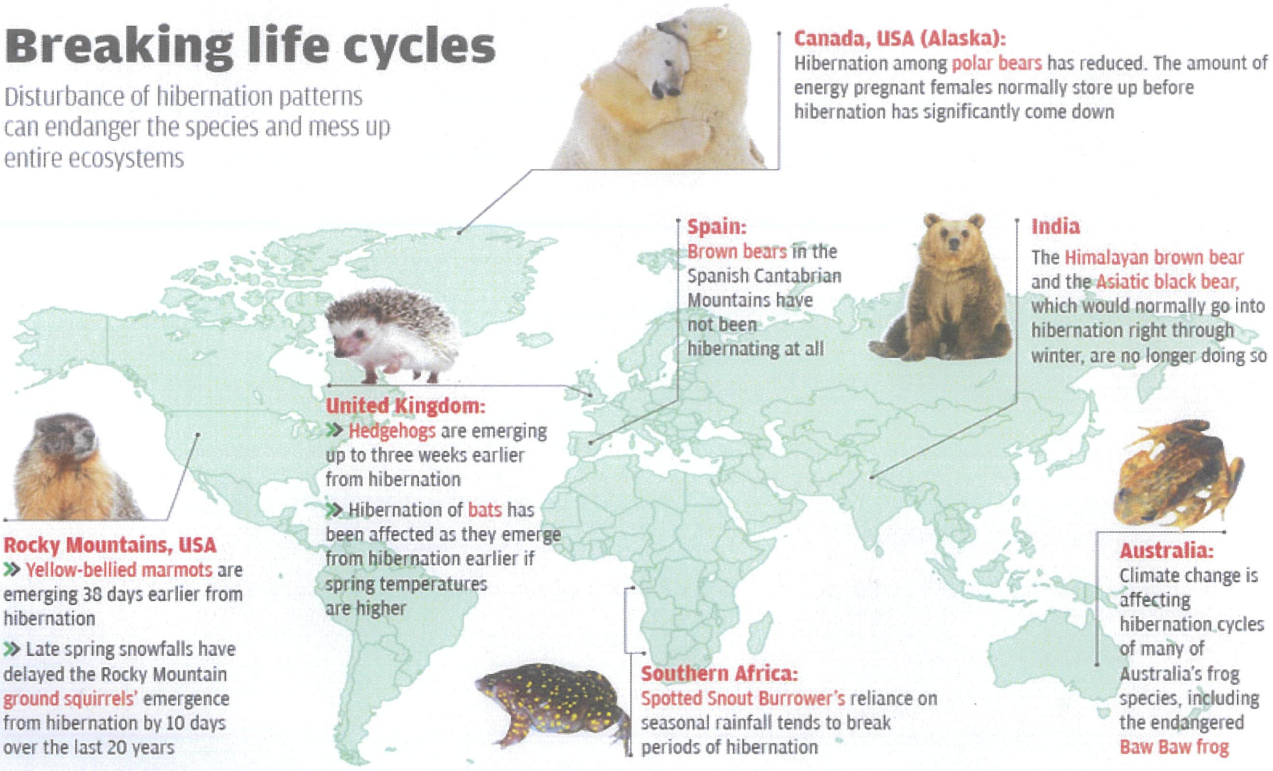
# Impact 2: Ice-caps melting

The second, but far more publicised impact of climate change, is the melting of Ice-caps and glaciers. Similar to blankets which often act as shields and safeguards when yearn warmth or feel frightened, ice and glacier act in a similar manner. Ice acts like a protective cover over the Earth and our oceans. These bright white spots reflect excess heat back into space and keep the planet cooler. In theory, the Arctic remains colder than the equator because more of the heat from the sun is reflected off the ice, back into space. On the other hand, glaciers provide a scientific record of how the climate has changed over time, and through their study, we gain valuable information about the extent to which the planet is rapidly warming. Not only in theory does their presence bring upon research and protection, but Ice-caps and Glaciers are also home to many diverse organisms, many of which seek shelter in these formations. Today, about 10% of land area on Earth is covered with glacial ice. Almost 90% is in Antarctica, while the remaining 10% is in the Greenland ice cap.




For the reasons discussed above, it is clearly evident as to why the melting and destruction of our Ice-caps and glaciers due to climate change is an extreme detriment to our environment. The line graph produced by the National Snow and Ice Data Centre displays the Artic Sea Ice Extent from a time period of 1979 – 2010. It is clearly identifiable that between the first of September and October the Arctic Sea Ice Extent fell just below four square kilometres (it's lowest) compared to the first of January, where the Ice Extent was positioned at 15 square kilometres (it's highest). The projections and falls could be due to a number of causes, such as: variations in the orbit of the earth (causing hotter or colder climates in the Arctic), deforestation, and oil and gas drilling. Nonetheless, each one of these causes links back to climate change, demonstrating how considerable of an impact climate change is having on our world.

# Impact 3: Hibernation disruptions




One of the less publicised but rather most devastating impacts of climate change is the effect it has on hibernation and migration patterns. Different climatic seasons are experienced throughout the year because the amount of sunlight changes as the Earth revolves around the Sun. Animals and plants have adapted their life cycles (birth, growth, reproduction, etc.) to the seasons and resource availability. Some animals have developed behaviours to cope with winter conditions, conserve energy and deal with food scarcity by migrating to a warmer climate or hibernating. Whilst others have adapted in similar ways when a hotter climate is experienced. Both migration and hibernation are sensitive to weather and climate, and climate change poses a challenge to migratory and hibernating species. The diagram above lists six species that are effected by climate change in regard to hibernation and migration. The diagram also includes the country by which each of the species originates from, an aspect that highlights how climate change is a global issue, rather than limited.

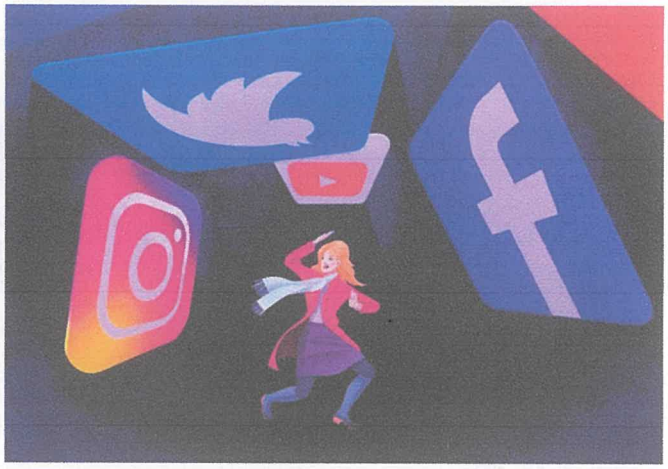

Located to the left of the page is a visual representation produced by the University of Calgary, which explores plant species and how they are affected by climate change. It was found that not only animals and humans experience hardships due to climate change, but plant (fauna and flora) species are facing inconsistent timing of key biological events, such as the flowering and fruiting in plants (i.e., phenology). This may leave certain animal species without a food source, as well as driving some plant species towards extinction.

# How social media has impacted the 'climate change movement'

Social media is a platform that brings upon both positive and negative associations as well as varied impacts towards the wellbeing of others and global issues such as the one discussed presently, climate change. Although unpredictable and misused at times, social media has brought greater amounts of stance of certain topics, such as the 'Black lives matter' movement, upholding and acknowledging women's rights, and so on. Despite this, social media also brings upon many misconceptions, misuse of 'platforms' or 'power', as well as the "online VS reality" theory.

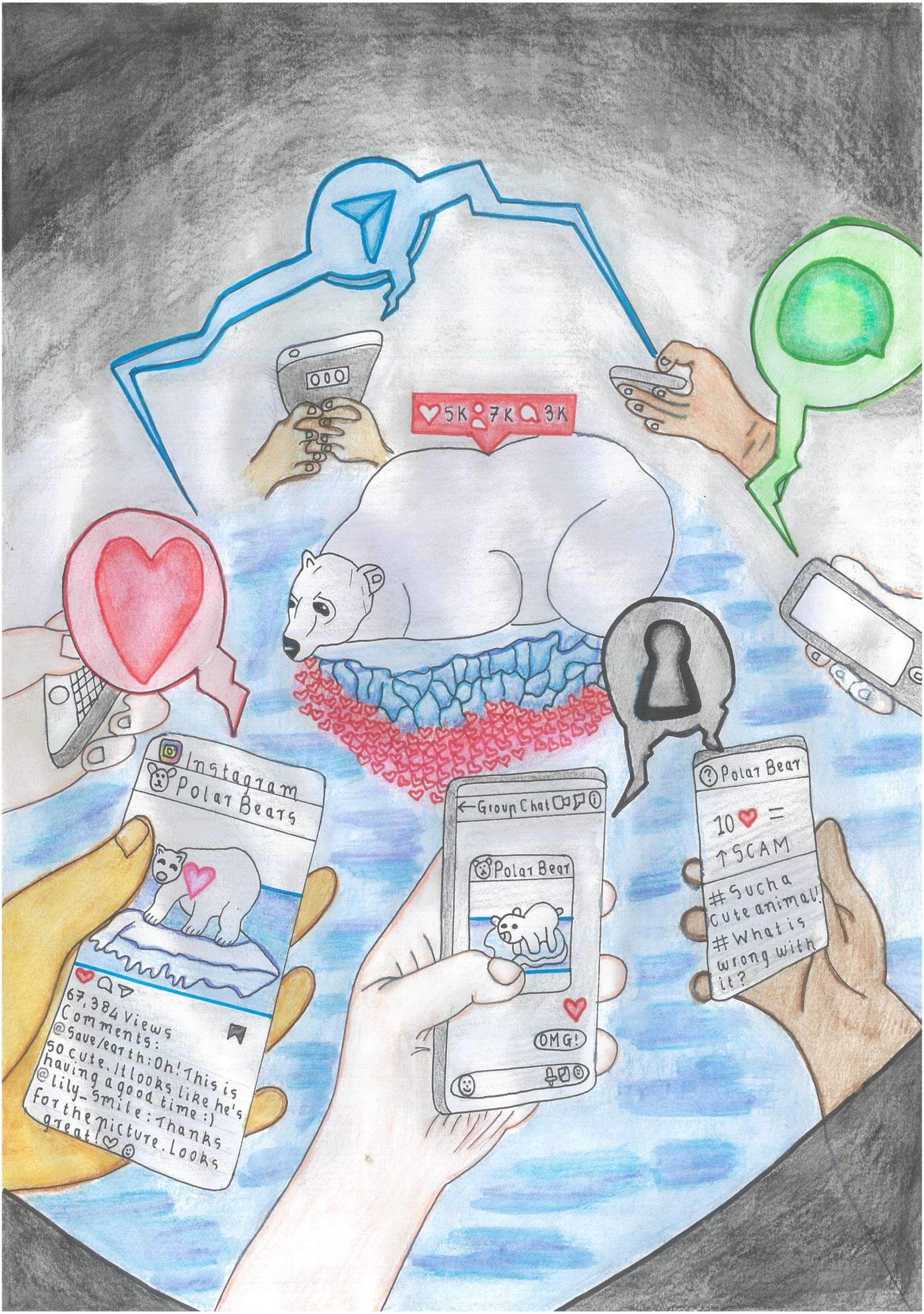
**Positive Impacts:**

On issues such as climate change, social media brings upon both positive and negative consequences. Focussing on the positive aspects first however, social media allows for large audiences to communicate and share respective knowledge with one another. Individuals are provided with valuable insights into topics which may be unexplored and 'uncharted' territory for others. Regarding climate change specifically, social media allows for awareness to be raised, whether this be in the form of campaigns, petitions, posters, or simply a paragraph explaining the selected issue or cause. By doing so, others are able to act in an efficient manner upon specific issues (such as the burning of coal, promoting renewable energy, etc.). Not only is social media a platform where collaborative work can be conducted, but also attracts individuals of all ages, ultimately allowing for opinions and experiences of all backgrounds and personalities to consolidate, and grow as individuals whilst working towards combatting issues such as the climate crisis.



**Negative Impacts:**

Public perception about the reality of climate change has remained polarized and disseminate of fake information on social media has been identified as a potential cause. Social media, one of the main drivers of polarization, publicises many misconceptions and information surrounding an issue as pressing as climate change. Social media as a platform has displayed such ignorance and naivety towards climate change and how it often 'clouds' the views of individuals seeking valuable and equitable information, with inaccurate and unreliable sources. Portrayed through the image on the right, I believe climate change has been widely undermined on various social media platforms. It encourages young children to instead of acting upon and contributing towards solving an issue (reality), to sit behind a screen and only *"acknowledge"* or *"like"* posts from others – such as the one on the right, of a polar bear struggling to stay afloat on a melting ice-cap – which in reality, only makes the individual feel satisfied within themselves.


5K 7K 3K
Instagram
Polar Bears
67,384 Views
Comments:
@Save/earth: Oh! This is so cute. It looks like he's having a good time :)
@lily_smile: Thanks for the picture. Looks great!
Group Chat
Polar Bear
OMG!
Polar Bear
10 = ↑SCAM
#Such a cute animal! #What is wrong with it?

# Politicians. VS. Scientists

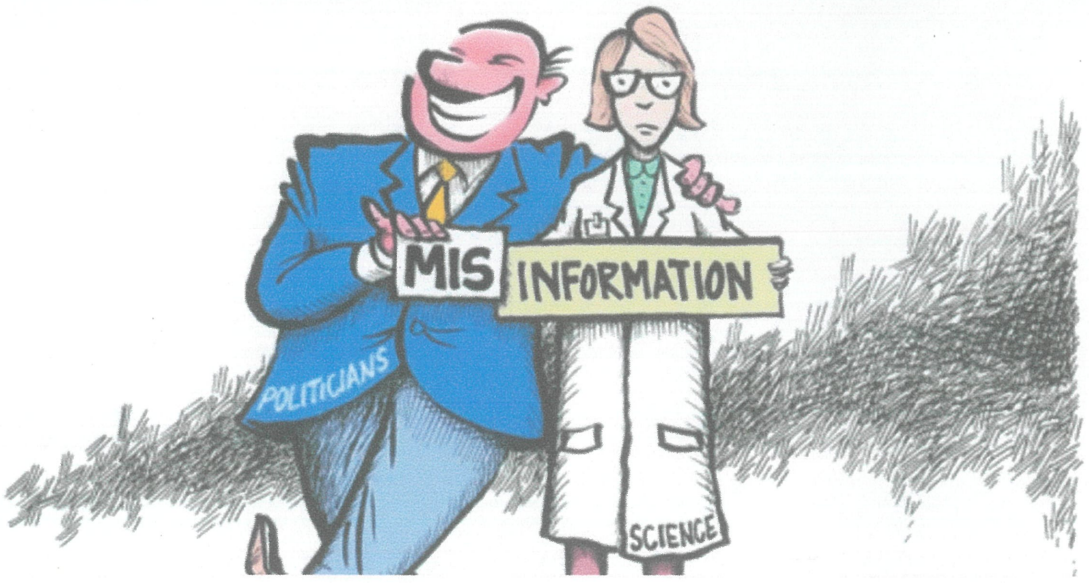
## The Great Debate

For many years, the ongoing feud between politicians and scientist surrounding climate change has been extremely controversial, with few attempts having been made to support and voice the opinions of the individuals whom hold the greatest amount of knowledge; scientists. For almost two whole years, the concept of human-induced climate change has become underpinned, and similarly, we have observed increased questioning surround scientific research and statements made public. There has also been an increasing polarisation between 'camps' that broadly accept the science and demand emission reductions and drastic action, and those who either reject it all outright, or retain a degree of caution about the actions to be taken. The validity of climate change science, as with any form of science, should always be open to genuine question and scrutiny – as all is up for interpretation or thorough review. Despite this, it has been made clear that the constant desire to undermine and invalidate scientific research surrounding climate change is far more than a simple "disagreement" or misunderstanding. Rather, it is a fight to convince the public eye that the economy should be preserved against our earth. The intersection of science and politics is rarely straightforward because the two disciplines operate from very different perspectives – it is for this reason that the debate surrounding the politics and scientific views is continuing, not yet reaching its peak.

*"It has not been easy for man to face time. Some, in recoiling from the fearsome prospect of time's abyss, have toppled backwards into the abyss of ignorance."*

- Claude Albritton

The quote above, written by Claude Albritton, highlights the comparison between political views and past decisions regarding the climate crisis, and their evident ignorance towards combatting it. Although there is almost no certainty in scientific research, this should by no means place a strain upon their findings, nor should this result in complete and utter disregard to the issue itself. The causes of climate change are simple, however it's often simplicity that politicians find hard to grasp. The burning of fossil fuels, regardless of its profound "benefit" on the economy, is destroying our earth. However as well as simplicity, t is often found that politicians fail to comprehend mitigating factors, such as the volcanoes in the southern hemisphere emitting gases, including, carbon dioxide – a factor not implemented by the age of the Anthropocene, but just, if not more debilitating. Our Earth is immensely complex and scientists the world over are doing their best to understand it. So when they form a consensus, we should listen.




OUR RESEARCH HAS FOUND:
WE ARE DESTROYING EARTH.
Could you kindly Rephrase that in an Equinocal, Inaccurate, vague, self serving, and Roundabout terms that we can all understand?
Economy
SCIENTISTS
POLITICIANS


CARBON footprints...
BASIC ACCEPTED SCIENCE
Climate CHANGE Denial

# 2°C

## A selected history of the two degrees limit

**1975** — Economist William Nordhaus expresses "a first intuition" that temperatures rising by more than two degrees above pre-industrial levels would "[take] the climate outside of the range of observations which have been made over the last several hundred thousand years"

**1988** — NASA scientist James Hansen testifies to Congress, linking greenhouse gas emissions to rising temperatures and the dangers associated with climate change

**1990** — Stockholm Environment Institute suggests two degrees above pre-industrial levels should be the maximum warming policymakers allow

**1992** — Rio Earth Conference sees formation of United Nations Framework Convention on Climate Change, tasked with stabilising greenhouse gas concentrations to "prevent dangerous anthropogenic interference with the climate system"

**1996** — European Council of environment ministers, including John Gummer and Angela Merkel, declare "global average temperatures should not exceed two degrees above pre-industrial level"

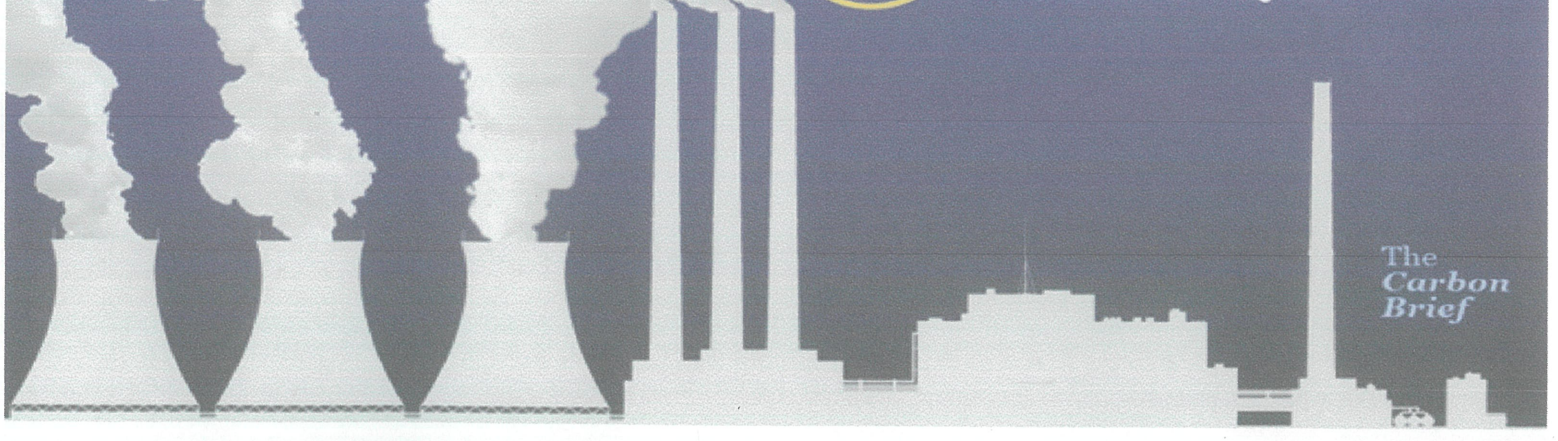
**1997** — 193 countries sign the world's first agreement to cut emissions: the Kyoto Protocol

**2001** — US president George W. Bush abandons effort to ratify Kyoto protocol

**2008** — US diplomats cut references to two degrees from draft G8 summit conclusion

**2009** — Copenhagen climate conference: world leaders fail to agree a deal to prevent temperatures rising more than two degrees, despite high expectations

**2010** — Cancun agreements commit governments to "hold the increase in global average temperature below two degrees"



The *Carbon Brief*

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