

COP26 GLOBAL DAY OF ACTION



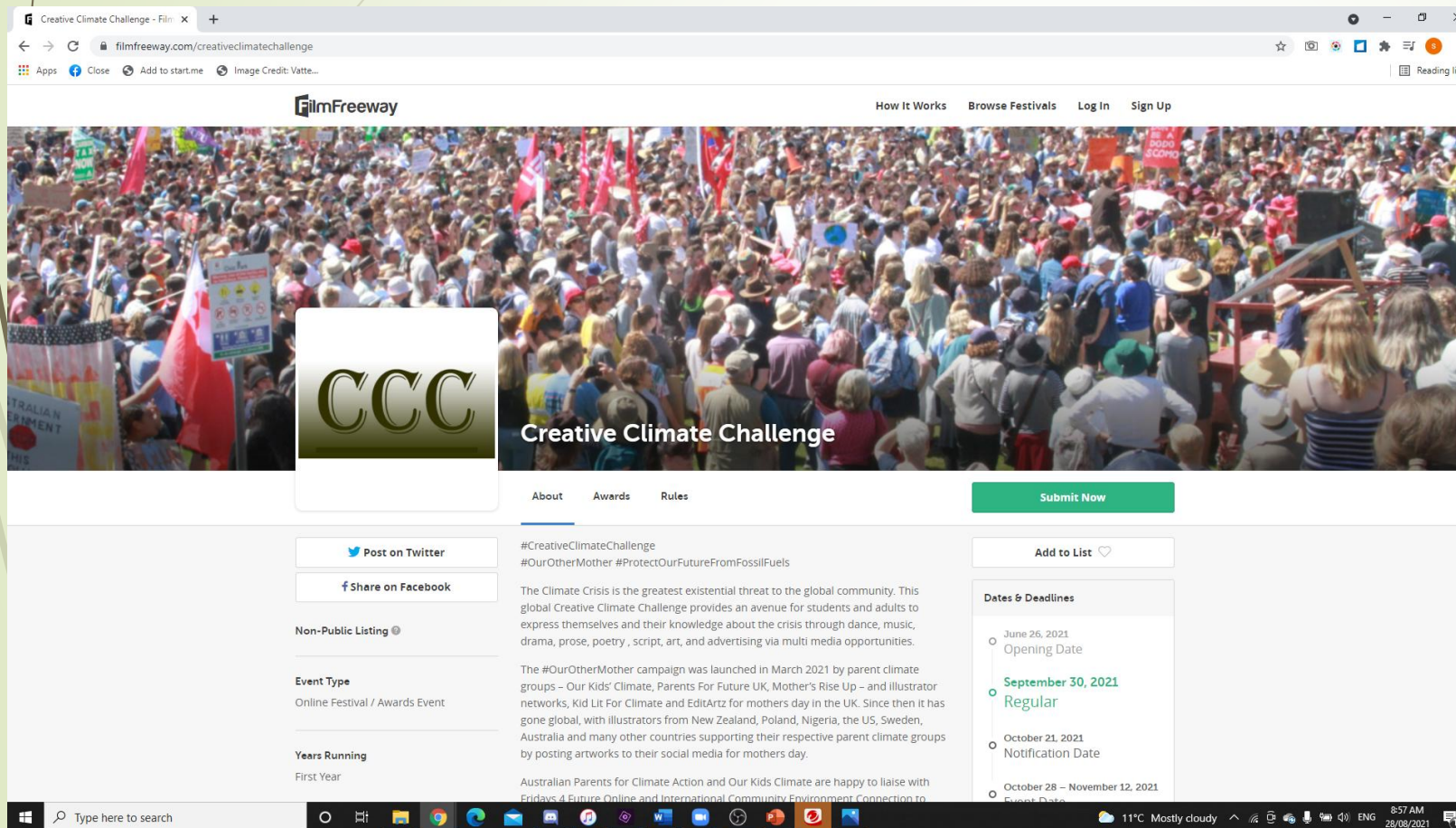


► [Going Extinct - https://twitter.com/UNFCCC/status/1453357941248208900](https://twitter.com/UNFCCC/status/1453357941248208900)

► [Pavilions - https://vimeo.com/642956592](https://vimeo.com/642956592)

Creative Climate Challenge

<https://filmfreeway.com/creativeclimatechallenge>

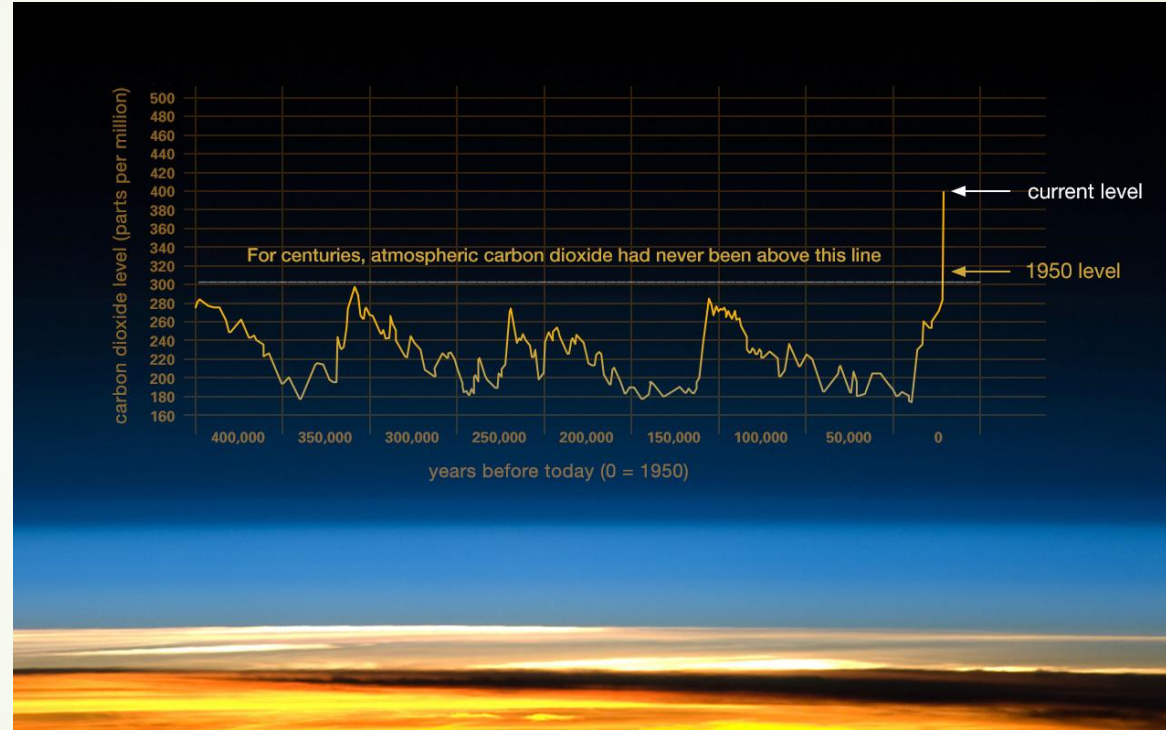
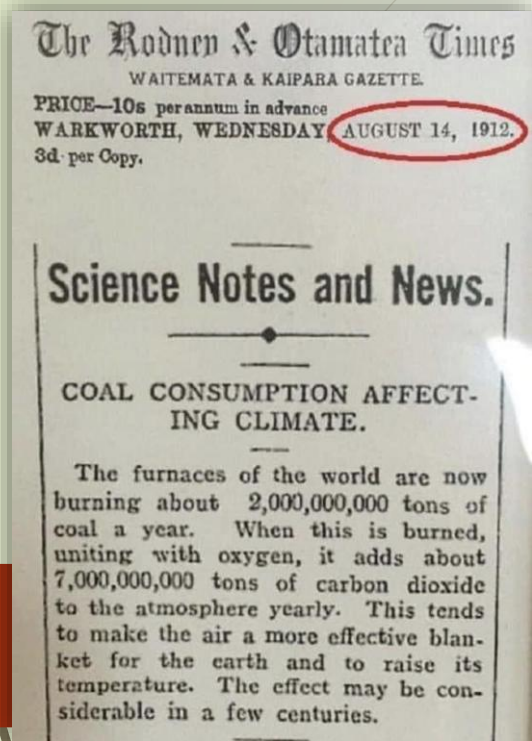


The screenshot shows the Creative Climate Challenge page on the FilmFreeway website. The page features a large background image of a crowd at a climate protest. The FilmFreeway logo is in the top left, and navigation links like 'How It Works', 'Browse Festivals', 'Log In', and 'Sign Up' are in the top right. The main heading 'Creative Climate Challenge' is prominently displayed. Below it, there are links for 'About', 'Awards', 'Rules', and a green 'Submit Now' button. A sidebar on the left includes social media sharing options for Twitter and Facebook, a 'Non-Public Listing' status, and event details such as 'Event Type: Online Festival / Awards Event' and 'Years Running: First Year'. The main content area contains a description of the challenge, its history, and a 'Dates & Deadlines' section listing key dates: June 26, 2021 (Opening Date), September 30, 2021 (Regular), October 21, 2021 (Notification Date), and October 28 – November 12, 2021 (Event Date). The bottom of the page shows a Windows taskbar with various application icons and the system clock indicating 8:57 AM on 23/08/2021.



The poster for the Creative Climate Challenge (CCC) is titled 'Creative Climate Challenge' with the date 'Closed 21 October 2021'. It features a central graphic with five colored shapes: a red circle labeled 'Dance', a green triangle labeled 'Drama', a yellow hexagon labeled 'Music', a blue circle labeled 'Visuals', and a green rectangle labeled 'Artwork'. The text on the poster describes the challenge as a global opportunity for students and adults to express their knowledge about the climate crisis through various creative mediums. It mentions the #OurOtherMother campaign and lists participating parent climate groups from around the world, including Our Kids' Climate, Parents For Future UK, Mother's Rise Up, and Illustrators' networks. The poster also highlights the challenge's global reach, with participants from New Zealand, Poland, Nigeria, the US, Sweden, and Australia. It concludes with a call to action to submit work by the deadline and provides the website URL: <https://filmfreeway.com/creativeclimatechallenge>. Logos for 'Illustrators' Networks Climate Action', 'ICEC', 'Parents & Future', and 'Our Kids' Climate' are at the bottom.

Global Warming – From Slow Onset Disaster (since industrial revolution 1750-1850) – to Climate Crisis Disaster in Oz (**Code Red for Humanity**)



Agenda 2030

SDG 13

Climate Action

**Sendai Framework
4 Priorities**

1. Understanding
4. Build Back Better

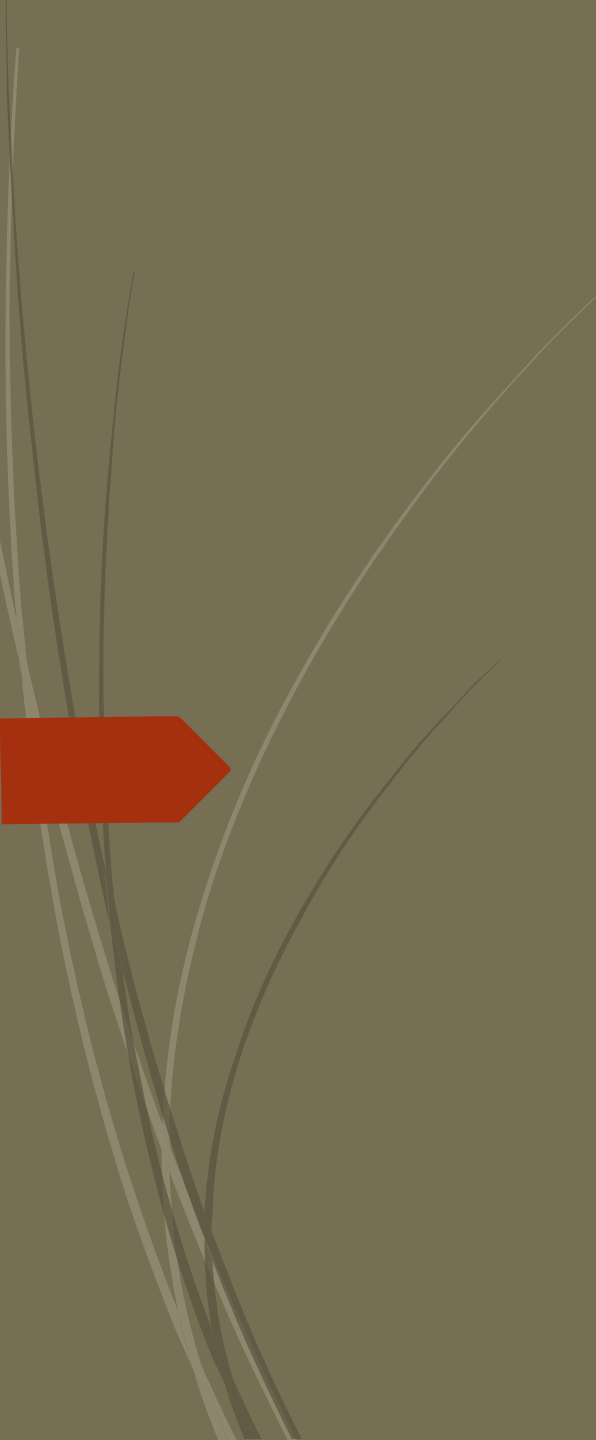
Impacts on physical and social infrastructure and communities

VIMEO LINK FOR AUDIO

<https://vimeo.com/634430891/9fba1f4ab8>

Password: t32021

'Understanding the Impact of Disasters'



What is a Disaster?



What is a Disaster (UN)

‘A serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of the affected society to cope using only its own resources’.

[United Nations 1992, Lessons Week 1, Slide 2]

*[WHO/EHA, DISASTERS & EMERGENCIES DEFINITIONS (2002). Training Package, Panafrican Emergency Training Centre, Addis Ababa: Updated (2002) by EHA.
<https://apps.who.int/disasters/repo/7656.pdf>]*



What is a Disaster Criteria via Red Cross

A situation that involves at least one of the following:

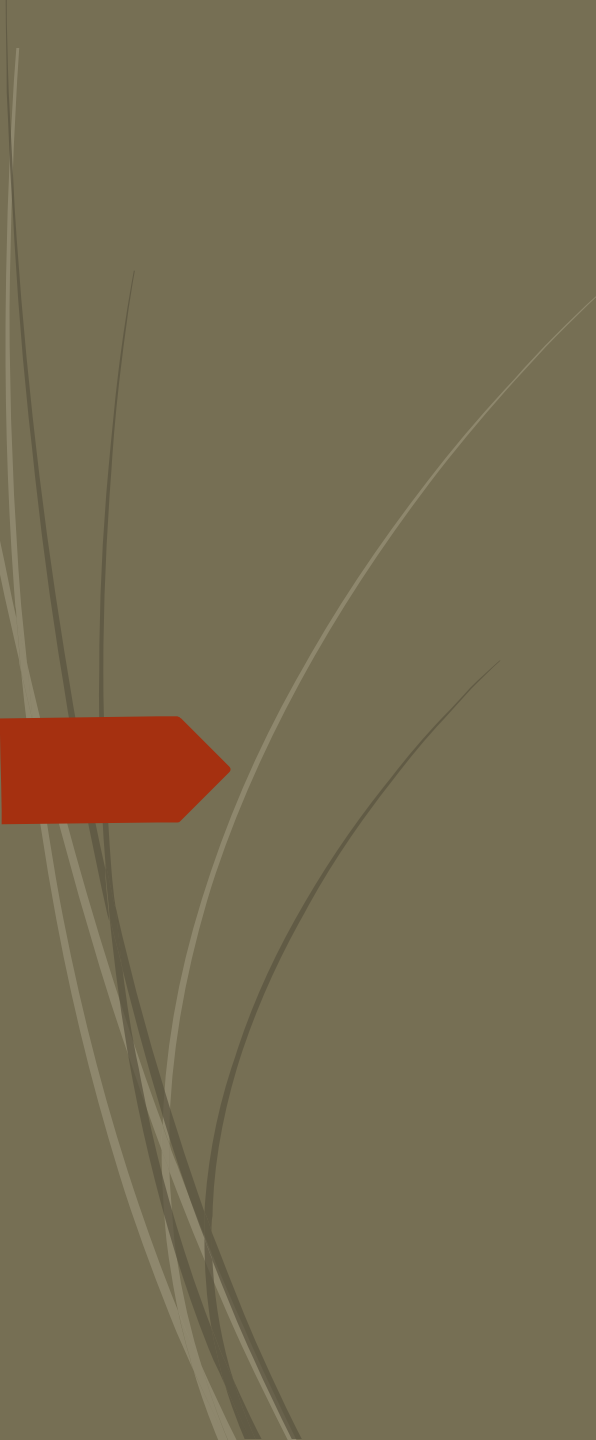
- ▶ Fatalities of 10 or more people
 - ▶ Impacting 100 people
- ▶ State of Emergency Declaration
- ▶ International Assistance requested

Source: Red Cross

[Lessons, Mod 1, Week 2, Slide 26]

Encapsulates hazard, vulnerability and exposure denoted by capacity or ability to cope

[Lessons, Mod 2 Week 3, Slide 4]



What is Global Warming?

Is it Really a Disaster?

IPCC – Revelations from compilation of research that is peer reviewed

QUOTE:

***'Human influence on the climate system** is clear, and recent **anthropogenic emissions** of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. {1}' pg. 2*

***'Warming of the climate system is unequivocal**, and since the 1950s, many of the **observed changes are unprecedented** over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. {1.1}' pg. 2*

'Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere, where such assessment is possible (medium confidence). The globally averaged combined land and ocean surface temperature data as calculated by a linear trend show a warming of 0.85 [0.65 to 1.06] °C over the period 1880 to 2012, when multiple independently produced datasets exist (Figure SPM.1a). {1.1.1, Figure 1.1}' pg. 2

Intergovernmental Panel on Climate change (2014). 'Climate Change 2014 - Synthesis Report – Summary for Policy Makers'. https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

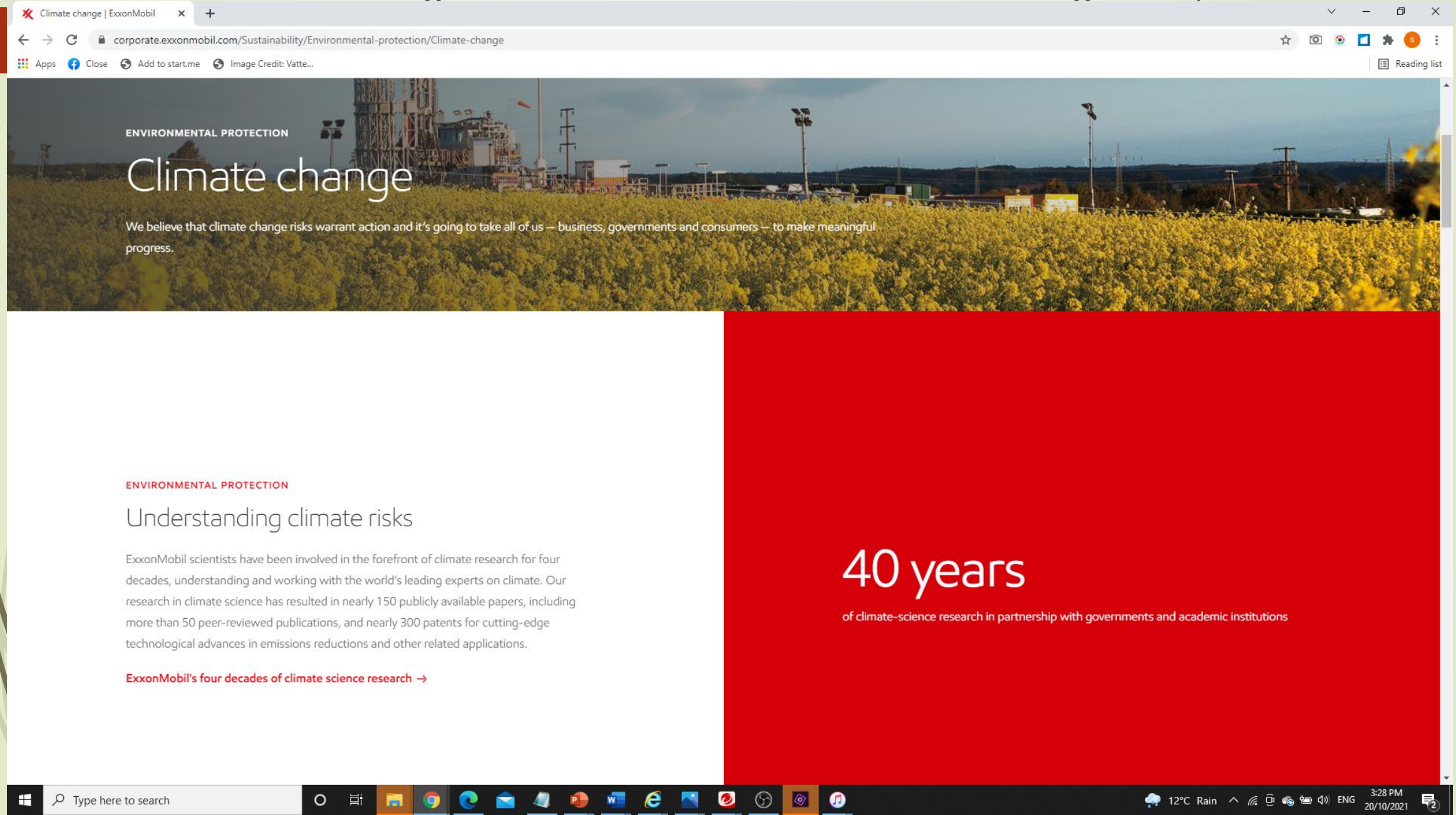
Anthropogenic – 'originating from human activity'

Scholarly Article on Global Warming

- “Climate change, once considered an issue for a distant future, has moved firmly into the present.”¹ Atmospheric and ocean temperatures are rising, “[p]recipitation patterns are changing, sea level is rising, the oceans are becoming more acidic, and the frequency and intensity of some extreme weather events are increasing.”² The 2017 Climate Science Special Report describes the current state of scientific knowledge about U.S. and global climate change. The report concludes that “it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation.”³
- Global data show that 2016 was the warmest year on record and the third consecutive year for record global average surface temperatures.⁴ In the continental United States, 2016 was the second warmest year on record, after 2012, with higher than average precipitation and fifteen climate-related disasters including drought, wildfire, floods, and severe storms, which caused losses of more than \$1 billion.⁵
- The emission of greenhouses gases (GHGs),⁶ which move about in the atmosphere, is a major cause of global climate change. GHGs absorb terrestrial radiation that leaves the Earth’s surface. Although GHGs “create the natural heat-trapping properties of the atmosphere” and are “necessary to life as we know it,” high concentrations of GHGs cause an increase in the Earth’s absorption of energy and the resulting increase in temperature referred to as global warming.⁷
- Recent research identifies deadly effects of climate change, “one of the biggest global threats to human health of the 21st century.”⁸ If global GHG emissions are not reduced, heat waves will affect 74% of the world’s population by 2100. Even with drastic GHG reductions, almost half of humans will face deadly heat.⁹ In Europe, increasing temperatures will result in weather disasters, especially heat waves and coastal flooding, and a sharp increase in climate-related deaths by 2100.¹⁰ By 2050, climate change may affect nutrition in developing countries as rising temperatures reduce availability of plant proteins.

[Margaret Rosso Grossman, ‘Climate Change and the Individual’ (2018). *The American Journal of Comparative Law*, Volume 66, Issue suppl_1, Pages 345–378. <https://doi.org/10.1093/ajcl/avy018>. https://academic.oup.com/ajcl/article/66/suppl_1/345/5035883]

Exxonmobil – 40 years of climate research with government and academics – co-authored Intergovernmental Panel on Climate Change chapters

A screenshot of a web browser displaying the ExxonMobil Climate Change page. The browser's address bar shows the URL 'corporate.exxonmobil.com/Sustainability/Environmental-protection/Climate-change'. The page features a large header image of a field of yellow flowers in the foreground and an industrial facility in the background. The text 'ENVIRONMENTAL PROTECTION' is in the top left, followed by 'Climate change' in large white letters. Below this, a paragraph states: 'We believe that climate change risks warrant action and it's going to take all of us — business, governments and consumers — to make meaningful progress.' The main content area is split into two columns. The left column has the heading 'ENVIRONMENTAL PROTECTION' and 'Understanding climate risks', followed by a paragraph about ExxonMobil's 40 years of climate research. The right column has a large red background with the text '40 years' in large white letters, and 'of climate-science research in partnership with governments and academic institutions' in smaller white text below it. The Windows taskbar is visible at the bottom of the screen.

Climate change | ExxonMobil

corporate.exxonmobil.com/Sustainability/Environmental-protection/Climate-change

Apps Close Add to start.me Image Credit: Vatte...

ENVIRONMENTAL PROTECTION

Climate change

We believe that climate change risks warrant action and it's going to take all of us — business, governments and consumers — to make meaningful progress.

ENVIRONMENTAL PROTECTION

Understanding climate risks

ExxonMobil scientists have been involved in the forefront of climate research for four decades, understanding and working with the world's leading experts on climate. Our research in climate science has resulted in nearly 150 publicly available papers, including more than 50 peer-reviewed publications, and nearly 300 patents for cutting-edge technological advances in emissions reductions and other related applications.

[ExxonMobil's four decades of climate science research →](#)

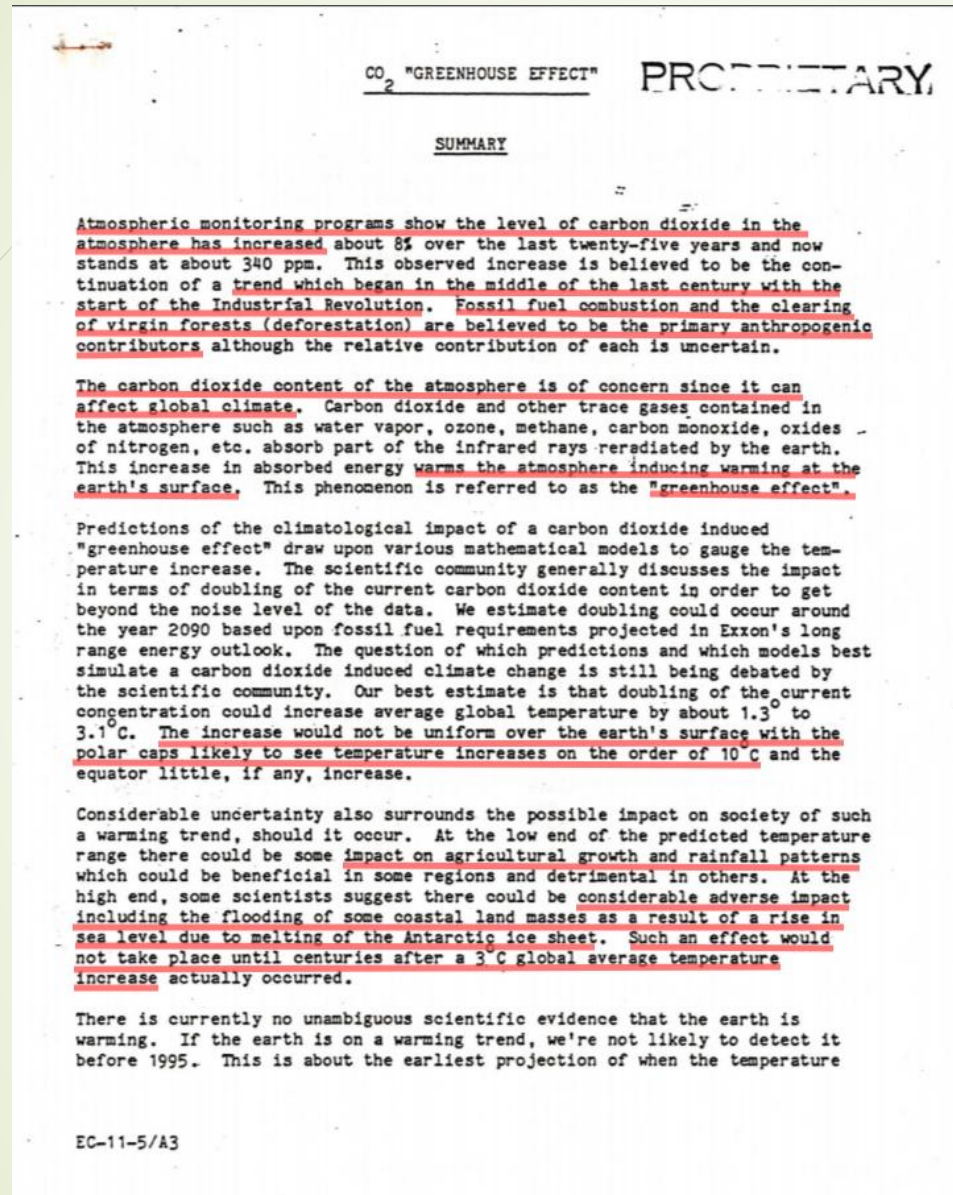
40 years

of climate-science research in partnership with governments and academic institutions

Type here to search

12°C Rain 3:28 PM 20/10/2021

EXXON Memo/Paper in 1982 on Greenhouse Effect



From the Global Warming source Itself:

A 1982 EXXON document explains atmospheric carbon dioxide levels had increased due to fossil fuel combustion and deforestation and that this can affect global climate through the phenomenon known as the 'greenhouse effect'

The 1982 EXXON document presented a graph that predicted the global warming that we are currently seeing, in terms of carbon dioxide levels in the atmosphere and resultant temperature rise, and predicted that we would reach over 430ppm carbon dioxide atmospheric concentration and a 1.5 degree warming around 2030.

'There is currently no unambiguous scientific evidence that the earth is warming'

Carbon Lifespan

- Is complex but...
- NASA suggests its between 300 and 1000 years
- It means that if carbon dioxide started accumulating in 1750 with the Industrial Revolution, then accumulation would remain until 2050 (best case scenario)
- The reason for complexity is the absorption in the ocean
- Sinks are a big issue – accumulation must occur where sinks are not sufficient. There is a feedback loop where forests burn – essentially releasing carbon dioxide and creating decreasing carbon sinks

[Alan Buis (2019). 'The Atmosphere: Getting a Handle on Carbon Dioxide: Sizing Up Humanity's Impacts on Earth's Changing Atmosphere: A Five Part Series'. *NASA's Jet Propulsion Laboratory*. <https://climate.nasa.gov/news/2915/the-atmosphere-getting-a-handle-on-carbon-dioxide/>]

Where Do Greenhouse Gases Come From?



Greenhouse gas	Lifetime	Global warming potential time horizon			Source ^a
		20 years	100 years	500 years	
Carbon dioxide	Complex	1	1	n.a.	IPCC (2013)
		1	1	1	IPCC (2007)
		1	1	1	IPCC (2001)
		1	1	1	IPCC (1996)
Nitrous oxide	121	264	265	n.a.	IPCC (2013)
	114	289	298	153	IPCC (2007)
	114	275	296	156	IPCC (2001)
	120	280	310	170	IPCC (1996)
Methane	12.4	84	28	n.a.	IPCC (2013)
	12	72	25	7.6	IPCC (2007)
	12	62	23	7	IPCC (2001)
	14	56	21	6.5	IPCC (1996)

- *‘A **carbon dioxide equivalent** or **CO₂ equivalent**, abbreviated as **CO₂-eq** is a metric measure used to compare the emissions from various greenhouse gases on the basis of their **global-warming potential (GWP)**, by converting amounts of other gases to the **equivalent** amount of **carbon dioxide** with the **same global warming potential**’*

Eurostat Statistics Explained at
https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Carbon_dioxide_equivalent#:~:text=A%20carbon%20dioxide%20equivalent%20or,with%20the%20same%20global%20warming

^a Sources of the default values in Table 3: IPCC (2013) (Fifth Assessment Report, Working Group I, Chapter 8, Appendix 8.A); IPCC(2007) (Fourth Assessment Report, Working Group I, Chapter 2); IPCC (2001) (Third Assessment Report, Working Group I, Chapter 6); IPCC (1996) (Second Assessment Report, Working Group I, Chapter 2).

Feedback Loops



'The more ice that melts, the more dark-coloured ocean is exposed, and the more heat the world absorbs.'

Photograph: Nick Cobbing/Greenpeace/Reuters'

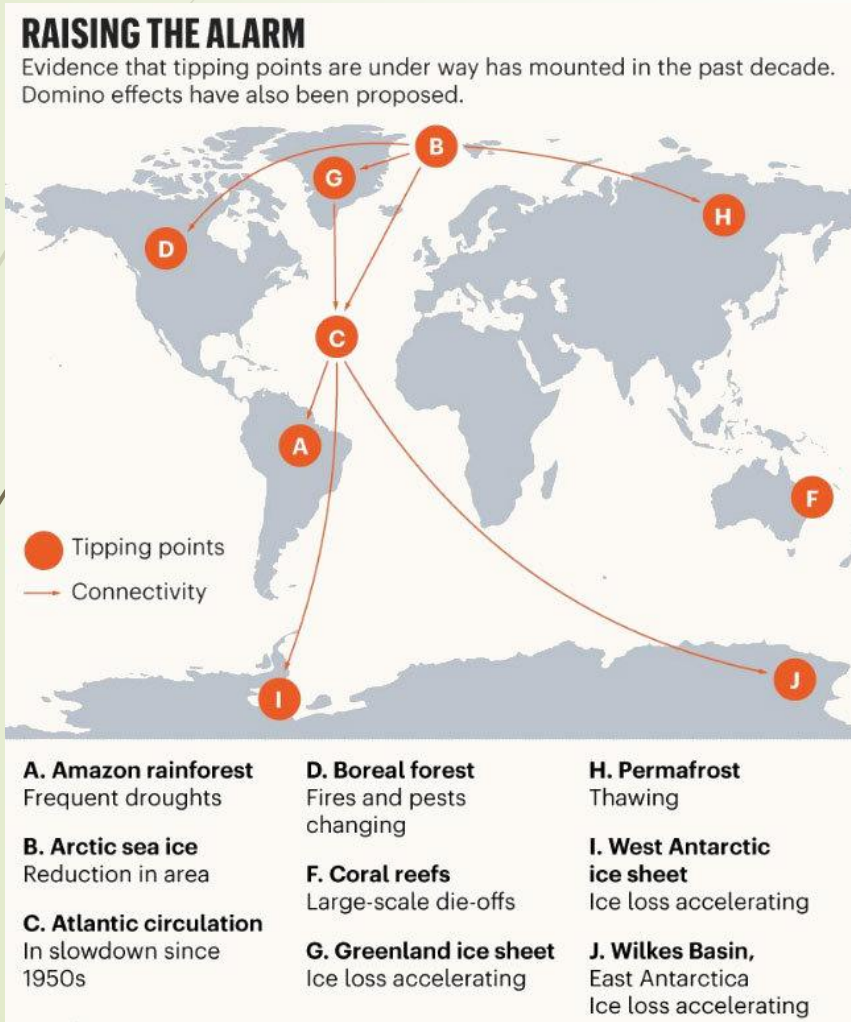
'In climate change, a feedback loop is the equivalent of a vicious or virtuous circle – something that accelerates or decelerates a warming trend. A positive feedback accelerates a temperature rise, whereas a negative feedback decelerates it.'

*Scientists are aware of a number of positive feedbacks loops in the climate system. One example is melting ice. Because ice is **light-coloured and reflective**, a large proportion of the sunlight that hits it is bounced back to space, which limits the amount of warming it causes. **But as the world gets hotter, ice melts, revealing the darker-coloured land or water below.** The result is that more of the sun's energy is absorbed, leading to more warming, which in turn leads to more ice melting – and so on.*

Various other feedbacks – related to emissions from soils and permafrost, for example, and changes to ocean evaporation – are known or thought to exist.'

*The Guardian (2011). 'What are the climate change feedback loops'.
<https://www.theguardian.com/environment/2011/jan/05/climate-change-feedback-loops>*

*'New research warns that the earth may be approaching key tipping points, including the runaway loss of ice sheets, that **could fundamentally disrupt the global climate system**. A growing concern is a **change in ocean circulation, which could alter climate patterns** in a profound way.'*



'The potential tipping points come in three forms: runaway loss of ice sheets that accelerate sea level rise; forests and other natural carbon stores such as permafrost releasing those stores into the atmosphere as carbon dioxide (CO₂), accelerating warming; and the disabling of the ocean circulation system.'

Reference: Peer Reviewed

Timothy M. Lenton , Johan Rockström , Owen Gaffney , Stefan Rahmstorf , Katherine Richardson , Will Steffen & Hans Joachim Schellnhuber, 'Climate Tipping Points – Too Risky to Bet Against', 27 November 2019,
<https://www.nature.com/articles/d41586-019-03595-0>

Related:

Fred Pearce (2019). 'As Climate Change Worsens, A Cascade of Tipping Points Looms'. *YaleEnvironment360*. <https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-looms#:~:text=The%20potential%20tipping%20points%20come,of%20the%20ocean%20circulation%20system>
See also: NASA, 'The Study of Earth as an Integrated System'
https://climate.nasa.gov/nasa_science/science/

Tipping Points Already Reached

Tim Lenton's comments - 9 of 15 tipping points activated

"A decade ago we identified a suite of potential tipping points in the Earth system, now we see evidence that over half of them have been activated," said lead author Professor Tim Lenton, director of the Global Systems Institute at the University of Exeter.

"The growing threat of rapid, irreversible changes means it is no longer responsible to wait and see. The situation is urgent and we need an emergency response."

Nine active tipping points:

Arctic sea ice

Greenland ice sheet

Boreal forests

Permafrost

Atlantic Meridional Overturning Circulation

Amazon rainforest

Warm-water corals

West Antarctic Ice Sheet

Parts of East Antarctica

The collapse of major ice sheets on Greenland, West Antarctica and part of East Antarctica would commit the world to around 10 metres of irreversible sea-level rise.

Reducing emissions could slow this process, allowing more time for low-lying populations to move.

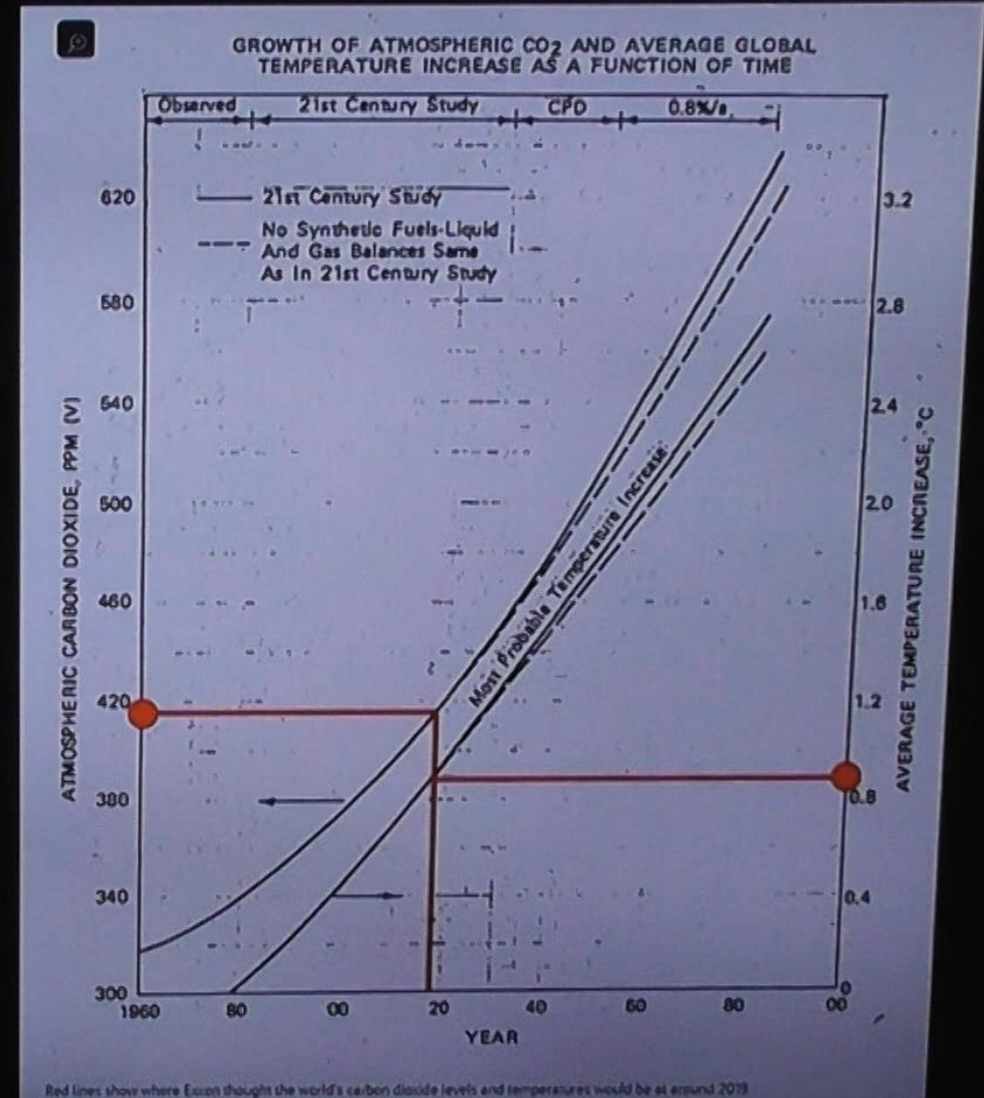
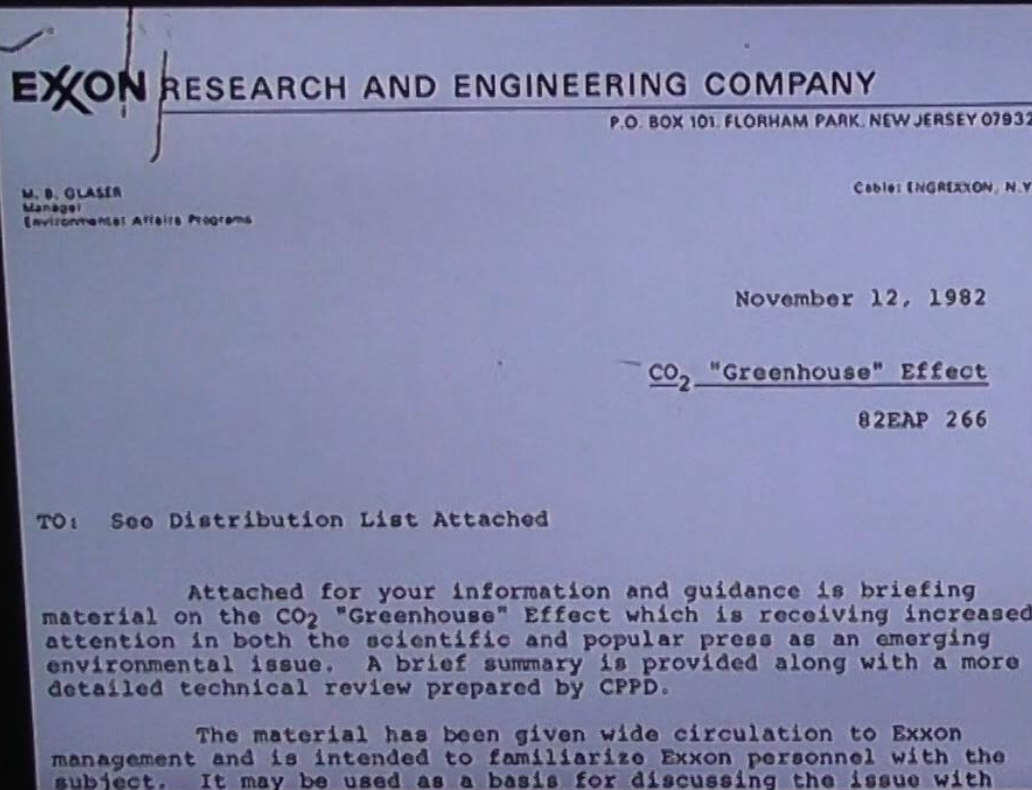
The rainforests, permafrost and boreal forests are examples of biosphere tipping points that if crossed result in the release of additional greenhouse gases amplifying warming.

University of Exeter. "Nine climate tipping points now 'active,' warn scientists." ScienceDaily. ScienceDaily, 27 November 2019. <www.sciencedaily.com/releases/2019/11/191127161418.htm>.

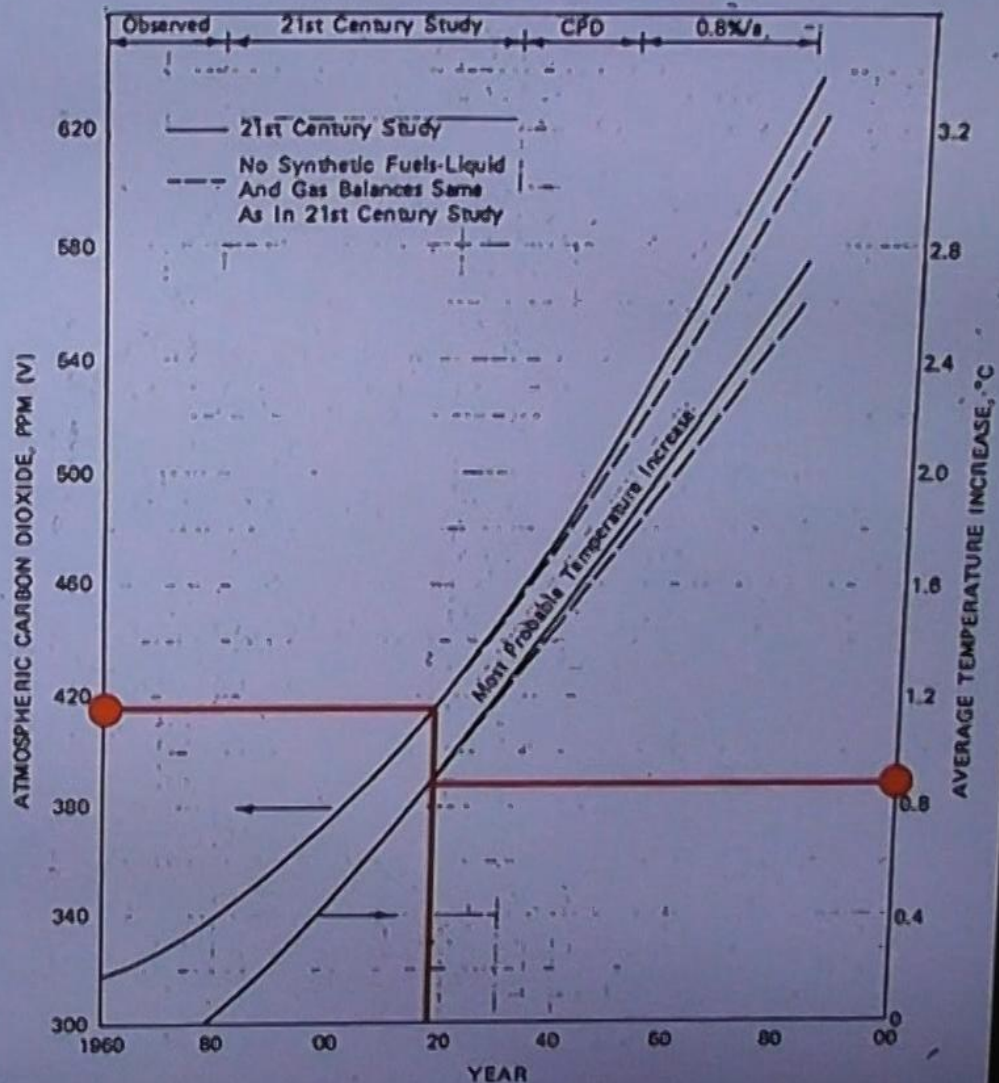
As mentioned in slide 10 this is based on Scholarly Article:

Timothy M. Lenton, Johan Rockström, Owen Gaffney, Stefan Rahmstorf, Katherine Richardson, Will Steffen, Hans Joachim Schellnhuber (2019). 'Climate tipping points — too risky to bet against'. *Nature*, 575 (7784): 592 DOI: 10.1038/d41586-019-03595-0

Projections of the Future



GROWTH OF ATMOSPHERIC CO₂ AND AVERAGE GLOBAL TEMPERATURE INCREASE AS A FUNCTION OF TIME



Red lines show where Exxon thought the world's carbon dioxide levels and temperatures would be at around 2019

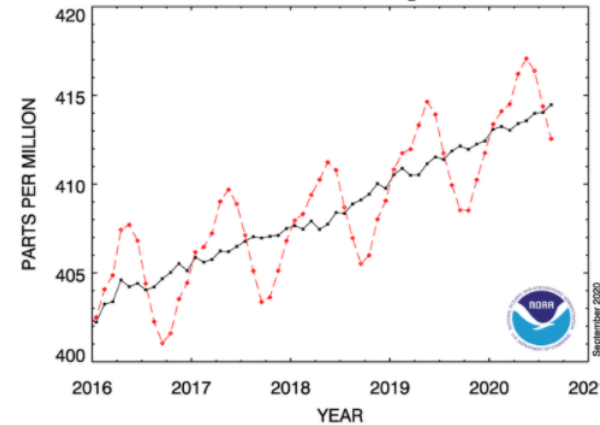
Monthly Average Mauna Loa CO₂

August 2020: 412.55 ppm

August 2019: 409.95 ppm

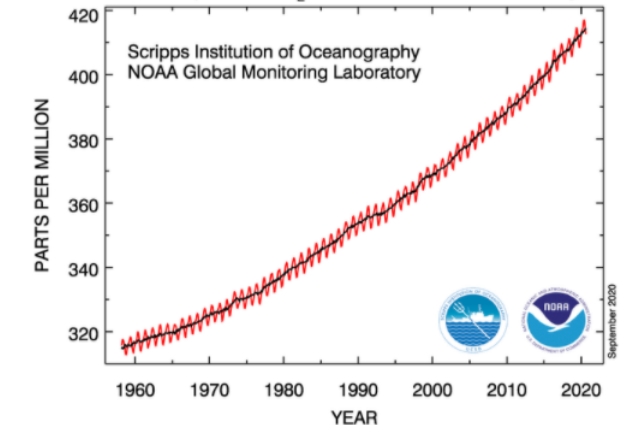
Last updated: September 9, 2020

RECENT MONTHLY MEAN CO₂ AT MAUNA LOA



[PNG Version](#) [PDF Version](#)

Atmospheric CO₂ at Mauna Loa Observatory



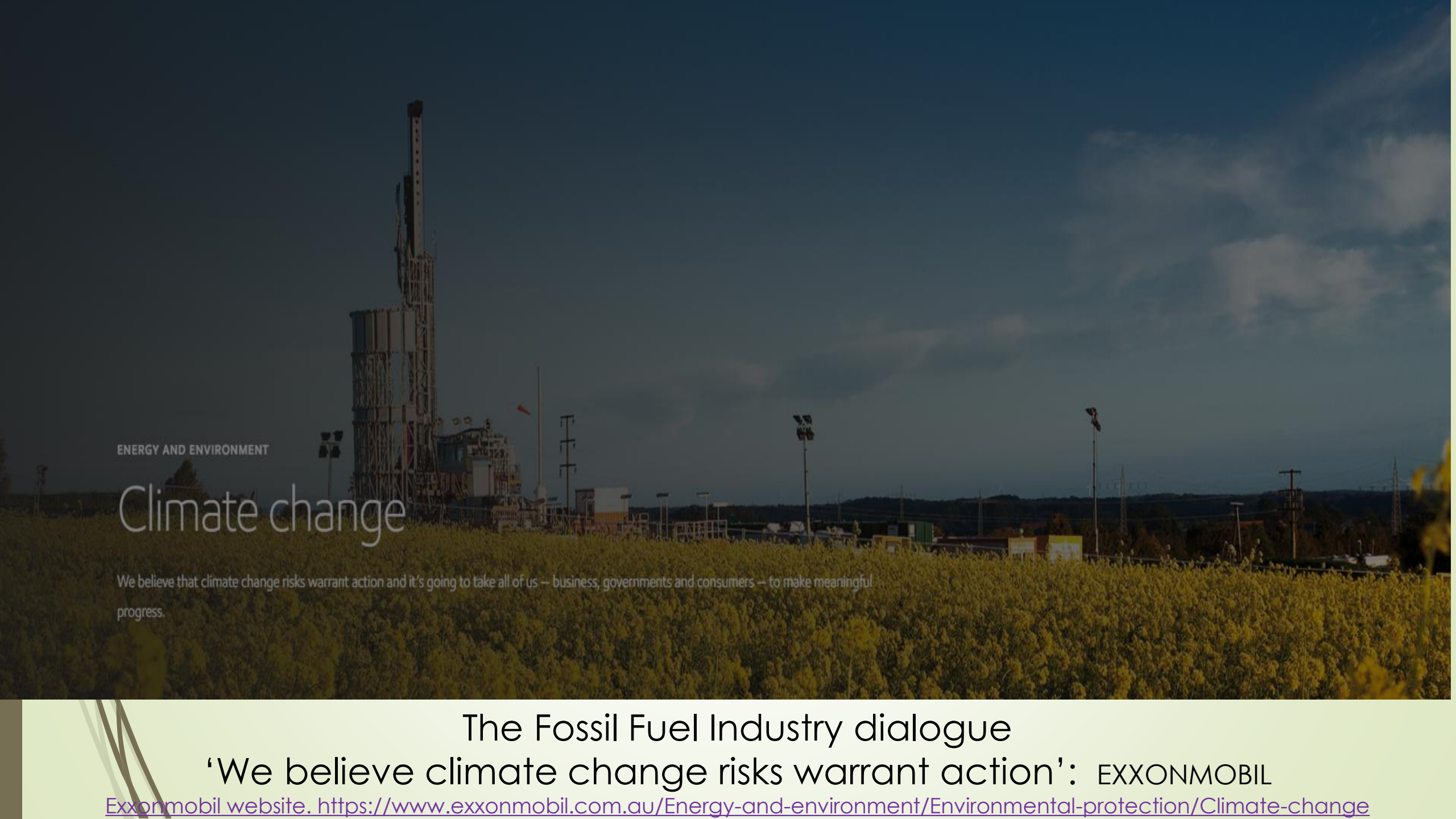
[PNG Version](#) [PDF Version](#)

EXXON research predictions released in a 1982 document (left graph) ties in with NOAA's data of 412.55ppm carbon dioxide concentration in the atmosphere (right graphs) and the United Nations IPCC advice that we are already seeing the consequence of a 1 degree celsius rise in global temperatures.

See:

[M.B.Glaser \(1982\). 'CO2 Greenhouse Effect, Memo'. Exxon Memo. https://www.documentcloud.org/documents/2805576-1982-Exxon-Memo-to-Management-About-CO2](#)
[Global Monitoring Laboratory, Earth Sydney Research Laboratory, https://www.esrl.noaa.gov/gmd/ccgg/trends/mlo.html](#)

Intergovernmental Panel on Climate Change (2018). 'Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by Governments'.
https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf
<https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>

The image is a banner from the ExxonMobil website. It features a background photograph of an industrial facility, likely an oil refinery or drilling site, with tall distillation columns and various pipes. In the foreground, there is a field of bright yellow wildflowers. The sky is a deep blue with some light, wispy clouds. The text is overlaid on the left side of the image.

ENERGY AND ENVIRONMENT

Climate change

We believe that climate change risks warrant action and it's going to take all of us — business, governments and consumers — to make meaningful progress.

The Fossil Fuel Industry dialogue

‘We believe climate change risks warrant action’: EXXONMOBIL

Exxonmobil website. <https://www.exxonmobil.com.au/Energy-and-environment/Environmental-protection/Climate-change>

Catastrophic Outlook beyond 2030

‘EXXON INTEROFFICE
DOCUMENT BY
PHYSICIST:

‘Whereas I can agree with the statement that our best guess is that observable effects in the year 2030 are likely to be ‘well short of catastrophic’, it is distinctly possible that the CPD scenario will later produce effects which will indeed be catastrophic’

GENERAL - 154-1-1B INTER-OFFICE CORRESPONDENCE		DATE August 18, 1981
TO	W. Glass	REFERENCE
FROM	R. W. Cohen	SUBJECT

I have looked over the draft of the EED reply to the request from O'Loughlin. The only real problem I have is with the second clause of the last sentence in the first paragraph: "but changes of a magnitude well short of catastrophic..." I think that this statement may be too reassuring. Whereas I can agree with the statement that our best guess is that observable effects in the year 2030 are likely to be "well short of catastrophic", it is distinctly possible that the CPD scenario will later produce effects which will indeed be catastrophic (at least for a substantial fraction of the earth's population). This is because the global ecosystem in 2030 might still be in a transient, headed for much more significant effects after time lags perhaps of the order of decades. If this indeed turns out to be case, it is very likely that we will unambiguously recognize the threat by the year 2000 because of advances in climate modeling and the beginning of real experimental confirmation of the CO₂ effect. The effects of such a recognition on subsequent fossil fuel combustion are unpredictable, but one can say that predictions based only on our knowledge of availability and economics become hazardous.

I would feel more comfortable if the first paragraph concluded with a statement to the effect that future developments in global data gathering and analysis, along with advances in climate modeling, may provide strong evidence for a delayed CO₂ effect of a truly substantial magnitude, a possibility which increases the uncertainty surrounding the post-2000 CPD scenario.

ROGER W. COHEN

RWC:tmw

Attachment

cc: H. N. Weinberg
A. J. Callegari

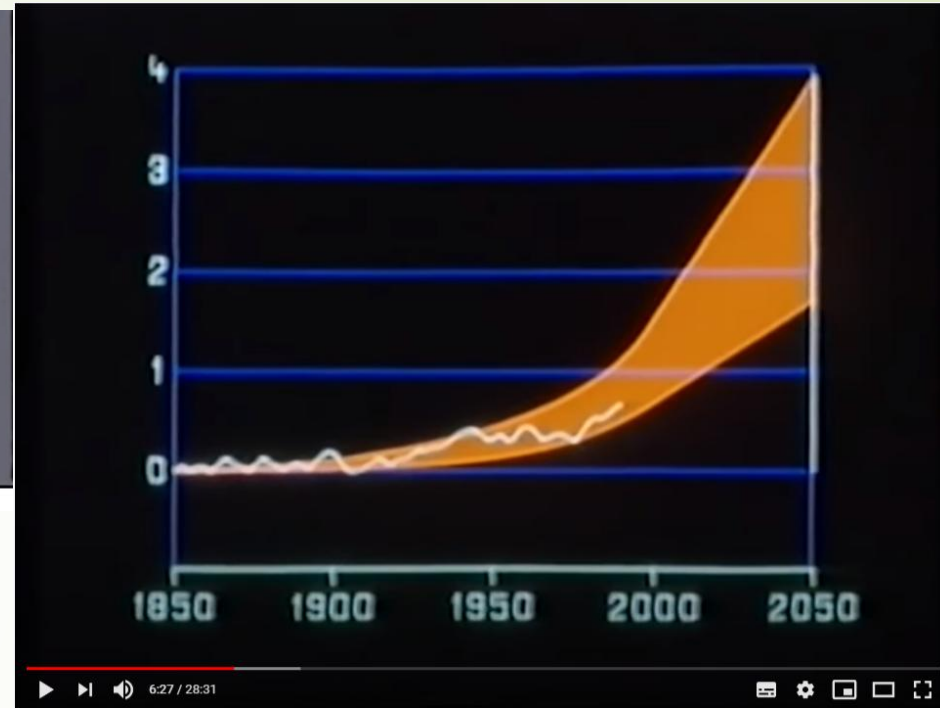
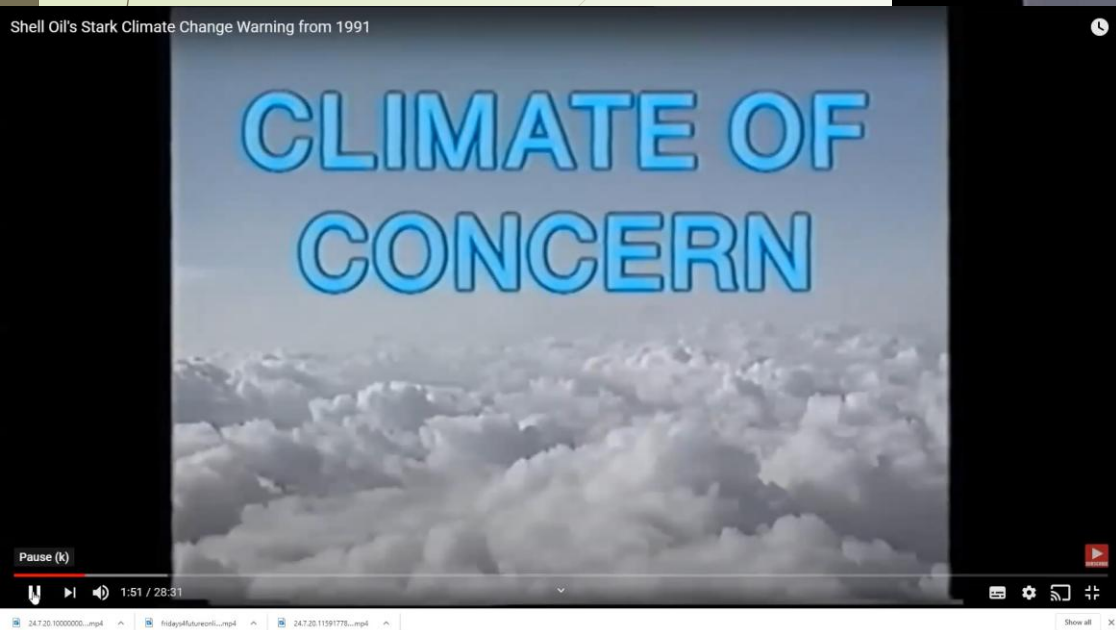
‘This is because the global ecosystem in 2030 might still be in a transient, headed for much more significant effects after time lags perhaps of the order of decades.’

Climate modeling, may provide strong evidence for a delayed CO₂ effect of a truly substantial magnitude’

R.W.Cohen (1981), Exxon Memo.
<https://www.climatefiles.com/exxonmobil/1981-exxon-memo-on-possible-emission-consequences-of-fossil-fuel-consumption/>

GLOBAL WARMING-

SHELL'S WARNING OF FAST CHANGE LEADING TO SEVERE DISLOCATION...



Climate of Concern - Royal Dutch Shell (1991)

Shell's 1991 documentary (Climate of Concern) also discussed the 'greenhouse effect' and outlined a small but significant warming trend over the century with computer modelling showing the possibility of **warming in the range of 1.5 degrees to 4 degrees by 2050** explaining that the rate of change could be faster than at any other time since the end of the ice age. The concern being **'change too fast perhaps for life to adapt without severe dislocation'**. They explained that scientists were foreseeing **not a steady even warming overall** but **'alternations to familiar patterns of climate'**. **They also saw impacts to Bangladesh and the Pacific Islands.**

Shell (1991). 'Climate of Concern'. <https://www.youtube.com/watch?v=0VOWi8oVXmo>

First 7 minutes at <https://vimeo.com/592784644>

GLOBAL WARMING- SHELL'S 1988 REPORT ON THE GREENHOUSE EFFECT

SHELL'S WARNING THAT FAST AND DRAMATIC CHANGES COULD HAVE SOCIAL, ECONOMIC AND POLITICAL CONSEQUENCES...



Report Series HSE 88-001

CONFIDENTIAL

THE GREENHOUSE EFFECT

CONFIDENTIAL

- 1 -

SUMMARY

Man-made carbon dioxide, released into and accumulated in the atmosphere, is believed to warm the earth through the so-called greenhouse effect. The gas acts like the transparent walls of a greenhouse and traps heat in the atmosphere that would normally be radiated back into space. Mainly due to fossil fuel burning and deforestation, the atmospheric CO₂ concentration has increased some 15% in the present century to a level of about 340 ppm. If this trend continues, the concentration will be doubled by the third quarter of the next century. The most sophisticated geophysical computer models predict that such a doubling could increase the global mean temperature by 1.3-3.3°C. The release of other (trace) gases, notably chlorofluorocarbons, methane, ozone and nitrous oxide, which have the same effect, may amplify the warming by predicted factors ranging from 1.5 to 3.5°C.

Mathematical models of the earth's climate indicate that if this warming occurs then it could create significant changes in sea level, ocean currents, precipitation patterns, regional temperature and weather. These changes could be larger than any that have occurred over the last 12,000 years. Such relatively fast and dramatic changes would impact on the human environment, future living standards and food supplies, and could have major social, economic and political consequences.

There is reasonable scientific agreement that increased levels of greenhouse gases would cause a global warming. However, there is no consensus about the degree of warming and no very good understanding what the specific effects of warming might be. But as long as man continues to release greenhouse gases into the atmosphere, participation in such a global "experiment" is guaranteed. Many scientists believe that a real increase in the global temperature will be detectable towards the end of this century or early next century. In the meanwhile, greater sophistication both in modelling and monitoring will improve the understanding and likely outcomes. However, by the time the global warming becomes detectable it could be too late to take effective countermeasures to reduce the effects or even to stabilise the situation.

The likely time scale of possible change does not necessitate immediate remedial action. However, the potential impacts are sufficiently serious for research to be directed more to the analysis of policy and energy options than to studies of what we will be facing exactly. Anticipation of climatic change is new, preventing undue change is a challenge which requires international cooperation.

With fossil fuel combustion being the major source of CO₂ in the atmosphere, a forward looking approach by the energy industry is clearly desirable, seeking to play its part with governments and others in the development of appropriate measures to tackle the problem.

'Mathematical models of the earth's climate indicate that if this warming occurs then it could create significant changes in sea level, ocean currents, precipitation patterns, regional temperature and weather. These changes could be larger than any that have occurred over the last 12,000 years. Such relatively fast and dramatic changes would impact on the human environment, future living standards and food supplies, and could have major social, economic and political consequences.'

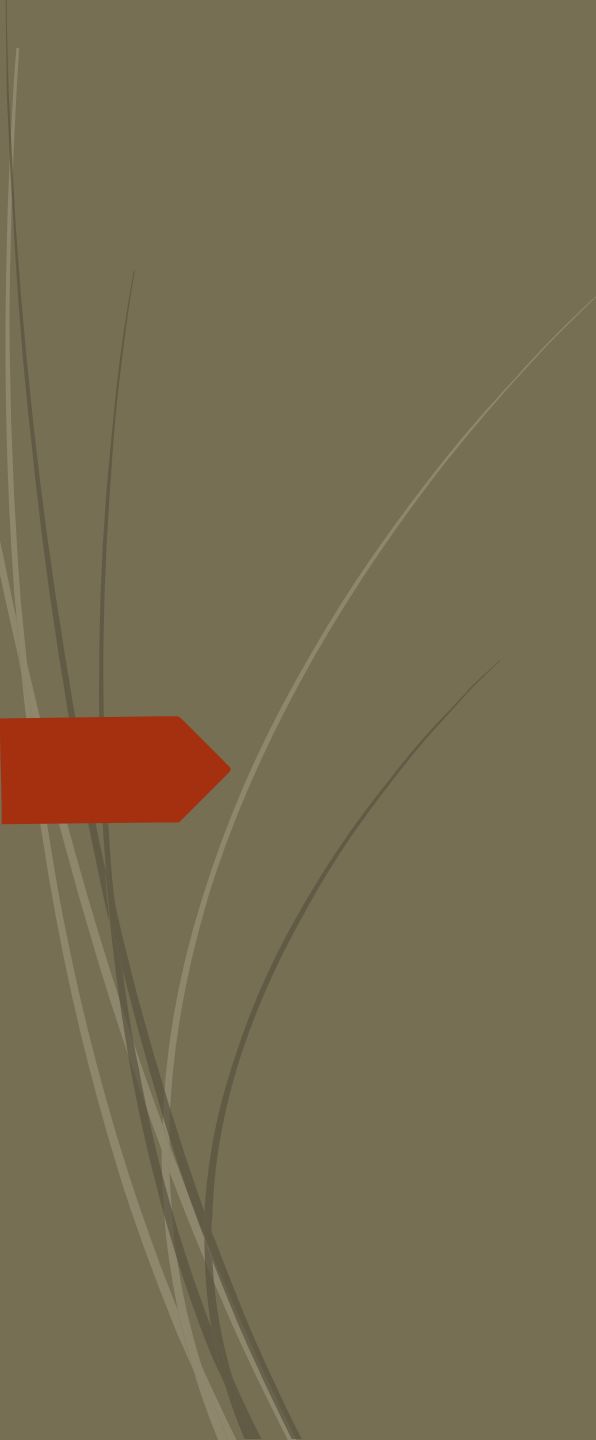
'By the time the global warming becomes detectable it could be too late to take effective countermeasures to reduce the effects or even to stabilize the situation.'

'The potential impacts are sufficiently serious for research to be directed more to the analysis of policy and energy options...'

'Fossil fuel combustion being the major source of CO₂ in the atmosphere...'

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SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ B.V., THE HAGUE
Health, Safety and Environment Division (HSE)



Global Warming?

What are the impacts?

Interactions between identified dimensions influencing capacity to deal with Hazards

Gianluca Pescaroli, David Alexander (2018). 'Understanding Compound, Interconnected, Interacting, and Cascading Risks: A Holistic Framework'. *Risk Analysis*, Volume 38, Issue 11, Pages 2245-2257. <https://doi-org.ezproxy.newcastle.edu.au/10.1111/risa.13128>

EXXON in 1982 on Greenhouse Effect

- 2 -

might rise the 0.5° needed to get beyond the range of normal temperature fluctuations. On the other hand, if climate modeling uncertainties have exaggerated the temperature rise, it is possible that a carbon dioxide induced "greenhouse effect" may not be detected until 2020 at the earliest.

The "greenhouse effect" is not likely to cause substantial climatic changes until the average global temperature rises at least 1°C above today's levels. This could occur in the second to third quarter of the next century. However, there is concern among some scientific groups that once the effects are measurable, they might not be reversible and little could be done to correct the situation in the short term. Therefore, a number of environmental groups are calling for action now to prevent an undesirable future situation from developing.

Mitigation of the "greenhouse effect" would require major reductions in fossil fuel combustion. Shifting between fossil fuels is not a feasible alternative because of limited long-term supply availability for certain fuels although oil does produce about 18% less carbon dioxide per Btu of heat released than coal, and gas about 32% less than oil. The energy outlook suggests synthetic fuels will have a negligible impact at least through the mid 21st century contributing less than 10% of the total carbon dioxide released from fossil fuel combustion by the year 2050. This low level includes the expected contribution from carbonate decomposition which occurs during shale oil recovery and assumes essentially no efficiency improvements in synthetic fuels processes above those currently achievable.

Overall, the current outlook suggests potentially serious climate problems are not likely to occur until the late 21st century or perhaps beyond at projected energy demand rates. This should provide time to resolve uncertainties regarding the overall carbon cycle and the contribution of fossil fuel combustion as well as the role of the oceans as a reservoir for both heat and carbon dioxide. It should also allow time to better define the effect of carbon dioxide and other infrared absorbing gases on surface climate. Making significant changes in energy consumption patterns now to deal with this potential problem amid all the scientific uncertainties would be premature in view of the severe impact such moves could have on the world's economies and societies.

The 1982 EXXON document stated that 'The greenhouse effect' is not likely to cause substantial climatic change until the average global temperature rises at least 1 degree. It explained that global warming would not be uniform and the polar caps would see high temperatures. It also outlined impacts on the low end on agricultural growth and rainfall patterns while on the high end flooding of some coastal land masses as a result of sea level rise due to Antarctic ice sheet melting.

Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, IPCC

- **“One of the key messages that comes out very strongly from this report is that **we are already seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes**,”** said Panmao Zhai, Co-Chair of IPCC Working Group I.
 - Intergovernmental Panel on Climate Change (2018). ‘Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by Governments’. United Nations. https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf
- More recently the **United Nations Secretary General** stated that we **were experiencing 1.2 degree warming**:
 - United Nations Secretary General (2019). ‘Secretary-General's statement on the IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment’. United Nations. <https://www.un.org/sg/en/content/secretary-generals-statement-the-ipcc-working-group-1-report-the-physical-science-basis-of-the-sixth-assessment>.
- The **Australian Bureau of Meteorology** in its State of the Climate report indicated that we were experiencing **1.44 degree warming in Australia** leading to increasing heat events:
 - Australian Government (2020). ‘State of the Climate 2020’. Bureau of Meteorology. <http://www.bom.gov.au/state-of-the-climate/>.

Committed Warming – Locked in Warming

- 'A.2.1. Anthropogenic emissions (including greenhouse gases, aerosols and their precursors) up to the present are **unlikely to cause further warming of more than 0.5°C** over the next two to three decades (high confidence) or on a century time scale (medium confidence). {1.2.4, Figure 1.5}'

Intergovernmental Panel on Climate Change (2018). 'Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by Governments'. *United Nations*. <https://www.ipcc.ch/sr15/chapter/spm/>

So we have 0.5 degree Celsius committed warming locked in to add to around 1 degree global warming already (1.5 degees) and 1.44 degree already nationally(1.94)

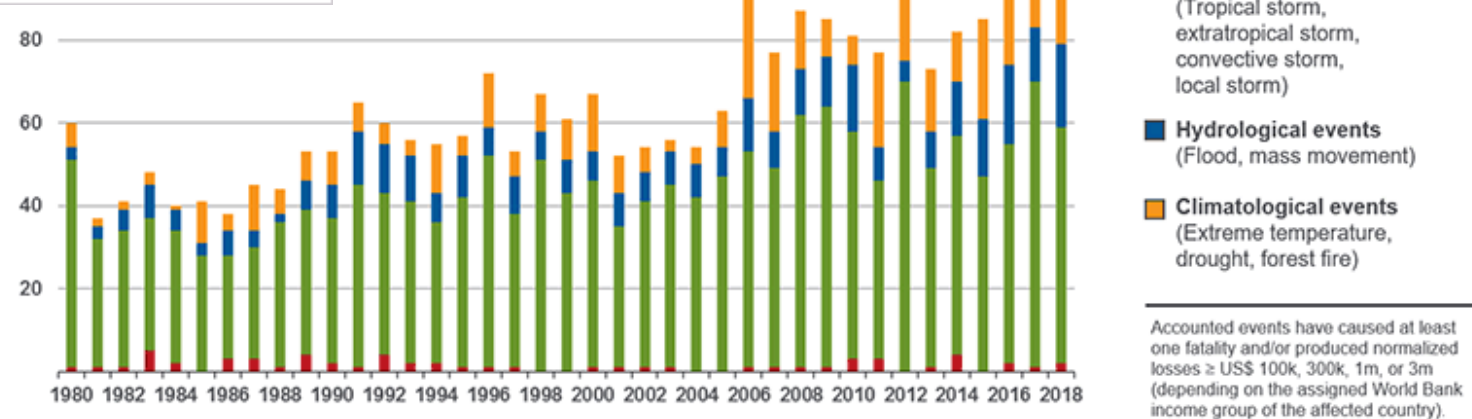
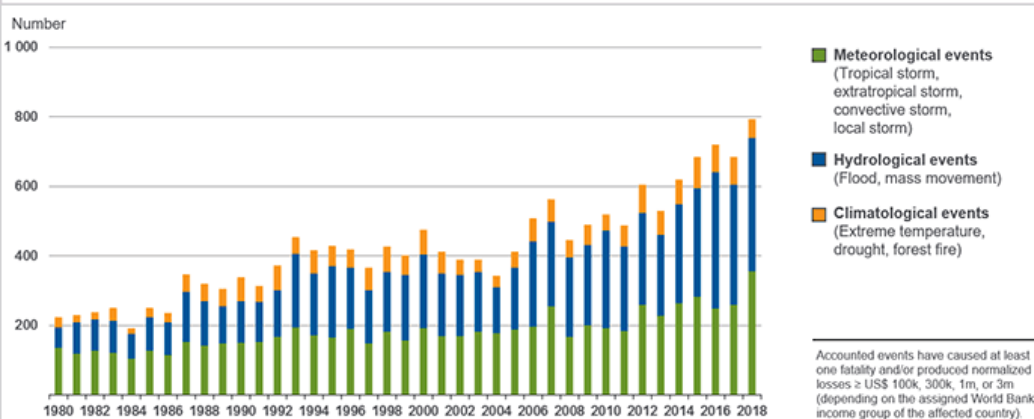
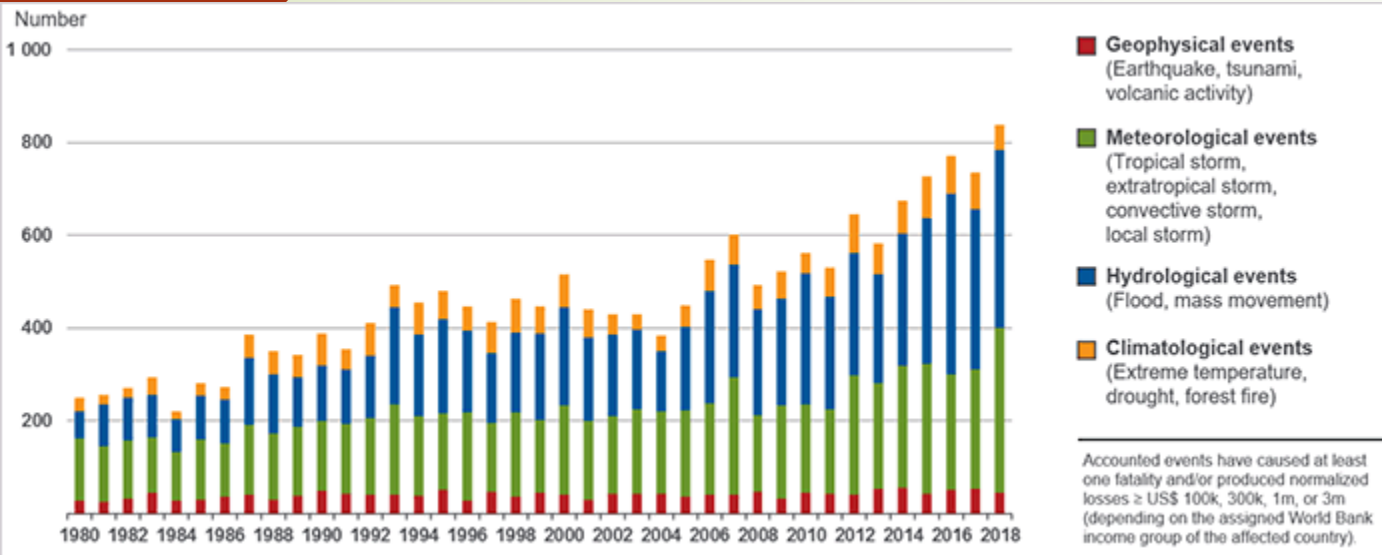
The United Nations World Metrological Organisation (WMO) indicated in July 2020 that 'there is a 20% chance that one of the next 5 years will be 1.5 degree warmer



- World Meteorology Organisation (2020). 'New climate predictions assess global temperatures in coming five years'. <https://public.wmo.int/en/media/press-release/new-climate-predictions-assess-global-temperatures-coming-five-years>

Worldwide Catastrophes

Graphs indicate that while Geophysical events remain fairly constant the amount of meteorological, hydrological, and climatic events have increased over time indicating that global warming is exacerbating natural hazards and increasing disasters.



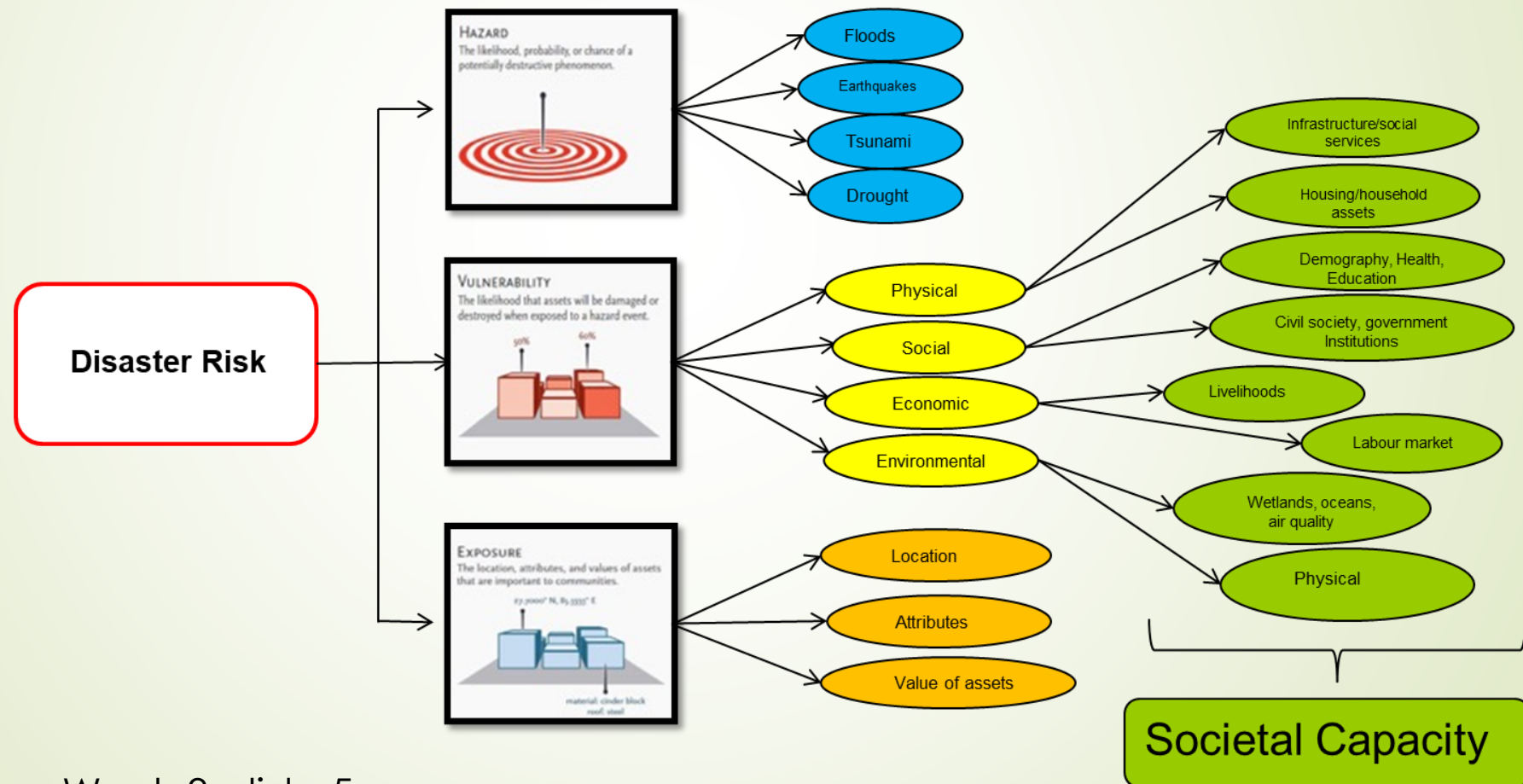
➤ Source: © 2019 Munich Re, Geo Risks Research, NatCatSERVICE. As of March 2019.

➤ <https://www.gccapitalideas.com/2020/04/21/protecting-our-planet-and-the-public-purse-climate-models-uneven-impact/>

➤ <https://www.iii.org/fact-statistic/facts-statistics-global-catastrophes>

Impacts from concept of Disaster:

What is physical and social infrastructure Communities





Global Warming to Climate Crisis Impacts

There are significant concerns regarding the impact of the climate crisis on natural hazards leading to an increase in disasters creating the argument that Global Warming is a slow on-set disaster itself through the evolution of hazard severity and frequency that are no longer seen as natural.

The question therefore relates to the impacts of global warming on physical and social infrastructure and communities. The first two are noted further by:

Physical - Infrastructure/social services and Housing/Household Assets

Social – Demography, health, education and civil society, government institutions

Global Warming, in terms of unprecedented fires to floods in the last two bushfire seasons with **drought** and **water scarcity issues**, **agricultural yield issues**, **severe and extreme participation**, **sea level rise**, and **changes to geographic weather**, impact on physical and social infrastructure and communities.

These **impacts will continue to increase** with continued exacerbated Global Warming through fossil fuel combustion and deforestation in terms furthering **positive feedback loops** that have been activated and those that will be activated concerning tipping points particularly for ice melt at the poles and resultant vicious cycles for further **abrupt ice melt** and methane emissions



COP26 SPECIAL REPORT ON
CLIMATE CHANGE AND HEALTH

THE HEALTH ARGUMENT FOR CLIMATE ACTION



WHO REPORT

"The burning of fossil fuels is killing us. Climate change is the single biggest health threat facing humanity. While no one is safe from the health impacts of climate change, they are disproportionately felt by the most vulnerable and disadvantaged."

'Increasingly frequent extreme weather events, such as heatwaves, storms and floods, kill thousands and disrupt millions of lives, while threatening healthcare systems and facilities when they are needed most. Changes in weather and climate are threatening food security and driving up food-, water- and vector-borne diseases, such as malaria, while climate impacts are also negatively affecting mental health.'

RELATED OPEN LETTER signed by over 450 organisations

'Air pollution, most significantly from burning fossil fuels which also drives climate change, is causing more than seven million premature deaths each year, that's 13 deaths every minute. Forest fires, waste burning, and harmful agricultural practices are also polluting our air and lungs.'

World Health Organisation (2021). 'WHO's 10 calls for climate action to assure sustained recovery from COVID-19', Media Release.

<https://www.who.int/news/item/11-10-2021-who-s-10-calls-for-climate-action-to-assure-sustained-recovery-from-covid-19>

World Health Organisation (2021), 'The Health Argument for Climate Action', <https://www.who.int/publications/i/item/cop26-special-report>

'Air pollution caused by the burning of fossil fuels such as coal and oil was responsible for 8.7m deaths globally in 2018, a staggering one in five of all people who died that year, [new research](#) has found.

Countries with the most prodigious consumption of fossil fuels to power factories, homes and vehicles are suffering the highest death tolls, with the study finding more than one in 10 deaths in both the US and Europe were caused by the resulting pollution, along with nearly a third of deaths in eastern Asia, which includes China. Death rates in South America and Africa were significantly lower.'

See also <https://www.theguardian.com/environment/2021/feb/09/fossil-fuels-pollution-deaths-research>

Deloitte Access Economics report

'The Obvious Cost of it all'

PREVIOUS COST PROJECTIONS in 2017 Report RISE EARLY FROM 2050 TO NOW:

'In real terms, the total economic cost of natural disasters is forecast to grow by 3.4% per year, double by 2038 and by 2050 reach \$39 billion per year in real terms.'

Insurance Australia Group Limited (IAG), *'Natural disaster costs to reach \$39 billion per year by 2050'*, 21 Nov 2017,

Insurance Australia Group Limited (IAG) (2021). 'Natural disaster costs to reach \$39 billion per year by 2050'. <https://www.iag.com.au/natural-disaster-costs-reach-39-billion-year-2050>

NEW COST PROJECTIONS IN 2021

'Climate change-related disasters will cost Australia \$73bn a year by 2060, even if action to curb emissions is taken now, a report has found.

And if nothing is done to tackle climate change, that figure will grow to \$94bn a year by that date, a study by Deloitte Access Economics says.'

'Under "low emissions", climate change is contained to a 1.7C increase above pre-industrial levels, with emissions falling to zero by 2100. The "medium" scenario means emissions start to decline by 2045, while under "high emissions" there are no efforts to curb them, causing temperatures to rise more than 2C by 2040, and 3C after 2060.

The report said the cumulative bill for Australia would run into the trillions over the next four decades.

"Over the next 40 years, the cost of natural disasters to the Australian economy is expected to be at least \$1.2tn in present value terms," the report said. "This cumulative cost would potentially increase by \$125bn if a higher emission scenario eventuates."

'The report found two-thirds of the cost will be borne by Queensland and New South Wales, with Melbourne vulnerable to flooding events due to its proximity to major rivers.

***Australia is already heavily exposed to natural disasters – fire, flood, hailstorms and hurricanes – that currently cost the country \$39b a year.** This figure is expected to rise dramatically as property values increase and more people move into areas vulnerable to extreme weather events that hit harder and more often.'*

Deloitte Access Economics (2021). 'Special report: Update to the economic, costs of natural disasters in Australia, Australian Business Roundtable for Disaster Resilience & Safer Communities'.
https://www.iag.com.au/sites/default/files/Newsroom%20PDFs/Special%20report%20_Update%20to%20the%20economic%20costs%20of%20natural%20disasters%20in%20Australia.pdf

Media Write Up

Royce Kurlmelovs (2021), 'Eye-watering': climate change disasters will cost Australia billions each year, study finds'. *The Guardian*.
<https://www.theguardian.com/environment/2021/oct/06/eye-watering-climate-change-disasters-will-cost-australia-billions-each-year-study-finds>

Climate Change observable impacts

GREAT BARRIER REEF – PHYSICAL IMPACT AND SOCIAL IMPACT

'Climate change is the greatest threat to the Great Barrier Reef and coral reefs worldwide' – without mitigation over 60,000 jobs and over \$6 billion to the economy are at risk. There have been multiple coral bleaching episodes that include back-to-back bleaching in 2016/2017. This is a social impact for First Nations who view the area as Sea Country.

Scholarly Article

'Tropical coral reefs are identified as one of the most sensitive ecosystems in the Special Report on Global Warming of 1.5 °C of the Intergovernmental Panel on Climate Change, with mass coral bleaching and mortality projected to increase due to interactions between rising ocean temperature, OA and increased frequency of storms (Hoegh-Guldberg et al., 2018). The report presents an extremely bleak outlook for these ecosystems, with a very high risk of loss of most (70%–90%) coral-dominated ecosystems and remaining structures being weakened due to OA if warming exceeds 1.5 °C. **The northern Great Barrier Reef already lost 50% of its shallow water corals during severe bleaching events in 2016–2017** (Hughes et al., 2017).'

LinwoodPendleton, OveHoegh-Guldbergdef, RebeccaAlbright, AnneKaupc, PaulMarshall, NadineMarshall, SteveFletcher, GunnarHaraldsson, LinaHansson (2019), 'The Great Barrier Reef: Vulnerabilities and solutions in the face of ocean acidification'. *Regional Studies in Marine Science*. 100729, <https://www.sciencedirect.com/science/article/pii/S2352485518306959>

- Great Barrier Reef Marine Park Authority website at <http://www.gbrmpa.gov.au/our-work/threats-to-the-reef/climate-change#:~:text=Climate%20change%20is%20the%20greatest,%2C%20agriculture%20and%20land%20clearing>.
- [World Heritage Conservation \(2017\)](#). 'Impacts of Climate Change on World Heritage Coral Reefs: A First Global Scientific Assessment'. United Nations. News. United Nations (2017). 'Assessment: World Heritage coral reefs likely to disappear by 2100 unless CO2 emissions drastically reduce'. [United Nations.. https://whc.unesco.org/en/news/1676](https://whc.unesco.org/en/news/1676)
- 'The Great Barrier Reef has an economic, social and icon asset value of \$56 billion. It supports 64,000 jobs and contributes \$6.4 billion to the Australian economy': Deloitte Access Economics(2017). 'At what price? The economic, social and icon value of the Great Barrier Reef'. <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf>
- 'Minister for Environment and the Great Barrier Reef Leeanne Enoch said that the Great Barrier Reef is a world heritage listed icon that contributes \$6 billion to the Australian economy every year and supports over 60,000 jobs.' The Queensland Cabinet and Ministerial Directory (2020). 'A win for the Great Barrier Reef and jobs'. Queensland government. <https://statements.qld.gov.au/statements/90026>
- Australian Government (2016). 'Coral Bleaching Events'. <https://www.aims.gov.au/docs/research/climate-change/coral-bleaching/bleaching-events.html>
- Sea Country for First Nations
 - Australian Government (2018). 'Traditional Owners of the Great Barrier Reef: The Next Generation of Reef 2050 Actions Final Report From The Reef 2050 Traditional Owner Aspirations Project'. <https://www.environment.gov.au/system/files/resources/7b495328-8097-4aab-84aa-67b2a9e789fb/files/reef-2050-traditional-owner-aspirations-report.pdf>

State of Emergency for Fires/Floods – Australia

UNPRECEDENTED FIRES/FLOODS - PHYSICAL INFRASTRUCTURE IMPACTS

- **Unprecedented** fires and floods in Queensland over the 2018/2019 summer estimated \$1.5b. 'Let's be clear our climate has already changed'. Qld Premier.
 - Included over 600,000 cattle losses. <https://theconversation.com/catastrophic-queensland-floods-killed-600-000-cattle-and-devastated-native-species-120753>
 - <https://www.abc.net.au/news/2019-02-19/climate-change-and-the-cost-of-qlds-summer-of-disasters/10826122?nw=0&r=Gallery>
<https://www.brisbanetimes.com.au/politics/queensland/queensland-s-summer-of-natural-disasters-will-cost-1-5-billion-20190219-p50yvtv.html>
- Unprecedented fires along the east coast over the 2019/2020 summer.
 - Almost **three billion species lost** including **30% Koalas** who are suggested to go extinct in NSW by 2050

Naaman Zhou, 'Australia's environment minister says up to 30% of koalas killed in NSW mid-north coast fires', 27.12.19, <https://www.theguardian.com/australia-news/2019/dec/27/australias-environment-minister-says-up-to-30-of-koalas-killed-in-nsw-mid-north-coast-fires>

Graham Readfearn and Adam Morton, Almost 3 billion animals affected by Australian bushfires, report shows, The Guardian, 28 July 2020, https://www.theguardian.com/environment/2020/jul/28/almost-3-billion-animals-affected-by-australian-megafires-report-shows-a0e?fbclid=IwAR2L3Uha5PPfBQc5fWQmrZ1y2vyH8HiPm_RVJ7KU6hmPege_HckElzzC1Js
- **Fires in areas that have never burnt before** in Australia (Greg Mullins)
 - Greg Mullins (2019), 'Fires are burning where they never used to burn', *Sydney Morning Herald*. <https://www.smh.com.au/national/nsw/fires-are-burning-where-they-never-used-to-burn-20190909-p52pnn.html>



State of Emergency – Disaster of **Wildfires Across Borders**

Greg Mullins prior NSW Fire Commissioner
part of Emergency Leaders for Climate Action

- **'Irrefutable empirical scientific data'**, reinforced by observations of veteran firefighters and people on the land, confirm that a **warming climate, proven to be caused by the burning of coal, oil and gas**, is resulting in worsening and more frequent extreme weather events such as those that spawned the **2019-20 bushfires in NSW, Qld, SA, Victoria, WA and Tasmania**. **It is not possible to "adapt" to such catastrophic and escalating conditions, and they can only be partially mitigated'**.
- [Submission 36 (2020), Bushfire Inquiry from Emergency Leaders for Climate Leaders, pg.2]

Climate Crisis Impacts – NATURAL INFRASTRUCTURE IMPACTS

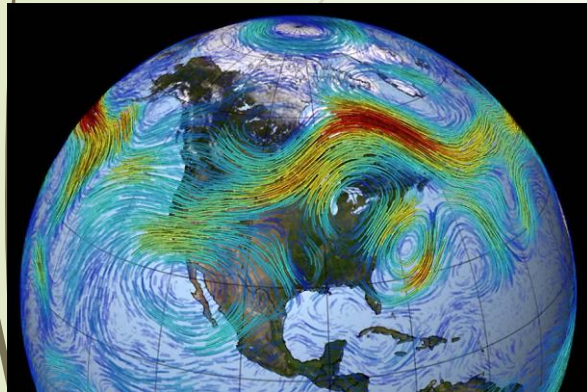
JET STREAM (Atmosphere - Extreme Pattern)

'Greenhouse gases are increasingly disrupting the jet stream, a powerful river of winds that steers weather systems in the Northern Hemisphere. That's causing more frequent summer droughts, floods and wildfires, a new study says.'

*'The study identifies how the faster warming of the Arctic **twists the jet stream into an extreme pattern that leads to persistent heat and drought extremes in some regions, with flooding in other areas.**'*

Bob Berwyn (2018), 'Global Warming Is Messing with the Jet Stream. That Means More Extreme Weather', Inside Climate News. <https://insideclimatenews.org/news/31102018/jet-stream-climate-change-study-extreme-weather-arctic-amplification-temperature>

Write up relates to scholarly article MICHAEL E. MANN, STEFAN RAHMSTORF, KORNHUBERBYRON A. STEINMAN, SONYA K. MILLER, STEFAN PETRI, AND DIM COUMOU (2018), 'Projected changes in persistent extreme summer weather events: The role of quasi-resonant amplification'. <https://www.science.org/doi/10.1126/sciadv.aat3272>



Jet Stream

GULF STREAM (Ocean - Slowing Down)

■ *'Visible from the air as a ribbon of cobalt blue water a few miles off the coast, the Gulf Stream forms part of a clockwise system of currents that transports warm water from the tropics up the east coast and across the Atlantic to northwestern Europe. In the frigid climate near Greenland, the water cools, sinks and flows south again, rolling through the deep ocean toward the tropics.'*

■ *'This marine circulatory system has reached its weakest point in 1,600 years, recent studies show, having lost about 15% of its strength since the mid-20th century. Scientists disagree on whether climate change or natural cycles account for the slowdown. But a consensus has emerged that climate change will lead to a slower Gulf Stream system in the future, as melting ice sheets in Greenland disrupt the system with discharges of cold fresh water. A weaker Gulf Stream would mean **higher sea levels** for Florida's east coast.'*

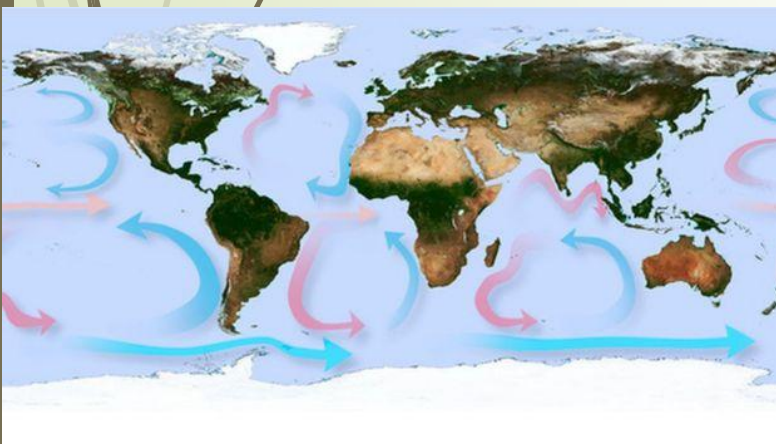
■ David Fleshler (2019). The Gulf Stream is slowing down. 'That could mean rising seas and a hotter Florida. Phys Org'. <https://phys.org/news/2019-08-gulf-stream-seas-hotter-florida.html>

■ Matt McGrath (2018). 'Slowing Gulf Stream current to boost warming for 20 years'. BBC. <https://www.bbc.com/news/science-environment-44875508>

■ Changlin Chen¹, Guihua Wang², Shang-Ping Xie³, and Wei Liu⁴ (2019). 'Why Does Global Warming Weaken the Gulf Stream but intensify the Kuroshio?', *Journal of Climate*, Volume 32 Issue 21. Print Publication: (2019), DOI: <https://doi.org/10.1175/JCLI-D-18-0895.1>, Page(s): 7437–7451. <https://journals.ametsoc.org/view/journals/clim/32/21/jcli-d-18-0895.1.xml>

Gulf Stream (slows by 15%)

■ L. Caesar, G. D. McCarthy, D. J. R. Thornalley, N. Cahill, S. Rahmstorf (2021). 'Current Atlantic Meridional Overturning Circulation weakest in last millennium'. *Nature Geoscience* (2021). DOI: 10.1038/s41561-021-00699-z, on page Potsdam Institute for Climate Impact Research (PIK) (2021). "Gulf Stream System at its weakest in over a millennium." *ScienceDaily*. <https://www.sciencedaily.com/releases/2021/02/210225113357.htm>



Gulf Stream

Rapid Ice Melt



■ ICE MELT – SEA LEVEL RISE

- Greenland/Arctic: 'A chunk of Greenland's ice cap estimated to be 110 square kilometres has broken off in the far north-east Arctic. Scientists say the incident is evidence of rapid climate change.'
 - ABC (2020). 'Greenland glacier loses 110 square kilometres' worth of ice'. <https://www.abc.net.au/news/2020-09-14/chunk-of-greenlands-ice-cap-has-broken-off/12663510>
- Antarctica:
 - POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH (2020), 'Stability Check on Antarctica Reveals High Risk for Long-Term Sea-Level Rise'. https://www.pik-potsdam.de/en/news/latest-news/stability-check-on-antarctica-reveals-high-risk-for-long-term-sea-level-rise?fbclid=IwAR0_DA6mGY-jFLQABZQK0oyh3Cq4wCtx1FmChCf55As5bXom9YJ-NWniQsE

Permafrost Craters in Russia due to ice melt & methane



'Gas accumulation and pressurized unfrozen rocks under lakes (sublake taliks) subject to freezing in shallow permafrost may lead to explosive gas emissions and the formation of craters.'

Evgeny Chuvilin , ORCID,Natalia Sokolova ,Dinara Davletshina,Boris Bukhanov ORCID,Julia Stanilovska,Christian Badetz and Mikhail Spasennykh, 'Conceptual Models of Gas Accumulation in the Shallow Permafrost of Northern West Siberia and Conditions for Explosive Gas Emissions' *Geosciences* 2020, 10(5), 195;
<https://doi.org/10.3390/geosciences10050195>

There have been reports of up to 7,000 methane mounds in Russia,

Inverse, '7,000 UNDERGROUND GAS BUBBLES IN SIBERIA ARE ABOUT TO BURST', <https://www.inverse.com/article/29362-siberia-bubble-methane-permafrost-explosion>,

'As the Arctic warms and permafrost degrades due to climate change, scientists are concerned that this methane may start leaking into the atmosphere in massive amounts, further exacerbating global warming'

Skolkovo Institute of Science and Technology (2020). 'Here be methane: Scientists investigate the origins of a gaping permafrost crater'. *Phys Org*. <https://phys.org/news/2020-06-methane-scientists-gaping-permafrost-crater.html>

Permafrost and dormant viruses

'Current natural populations face new interactions because of the re-emergence of ancient microbes and viruses. These risks come from the re-emergence of pathogens kept in laboratories or from pathogens that are retained in the permafrost, which become available upon thawing due to climate change.'

Shira Houwenhuyse, Emilie Macke, Lien Reyserhove, Lore Bulteel, and Ellen Decaestecker corresponding, 'Back to the future in a petri dish: Origin and impact of resurrected microbes in natural populations', *Evol Appl.* 11 Jan 11(1) 2018, pgg. 29-41. Published online 2017 Oct 17. doi: 10.1111/eva.12538 at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5748525/>

'This past summer anthrax killed a 12-year-old boy in a remote part of Siberia. At least 20 other people, also from the Yamal Peninsula, were diagnosed with the potentially deadly disease after approximately 100 suspected cases were hospitalized. Additionally, more than 2,300 reindeer in the area died from the infection. The likely cause? Thawing permafrost. According to Russian officials, thawed permafrost—a permanently frozen layer of soil—released previously immobile spores of Bacillus anthracis into nearby water and soil and then into the food supply. The outbreak was the region's first in 75 years.'

This article was originally published with the title "What Lies Beneath" in *Scientific American* 315, 5, 11-12 (November 2016), doi:10.1038/scientificamerican1116-11 at <https://www.scientificamerican.com/article/as-earth-warms-the-diseases-that-may-lie-within-permafrost-become-a-bigger-worry/>

'In what seems like a plot straight out of a low-budget science-fiction film, scientists have revived a giant virus that was buried in Siberian ice for 30,000 years — and it is still infectious. Its targets, fortunately, are amoebae, but the researchers suggest that as Earth's ice melts, this could trigger the return of other ancient viruses, with potential risks for human health.'

Ed Yong (2014), 'Giant virus resurrected from 30,000-year-old ice', *Nature* (2014). <https://www.nature.com/articles/nature.2014.14801>

Rained for the first time in the Arctic

'Winter rainfall and the subsequent loss of sea ice can threaten polar bear and reindeer populations too, because of the effect on their hunting grounds and the species they feed on.

Read more: <https://www.newscientist.com/article/2124366-forget-snow-rain-will-become-main-precipitation-in-the-arctic/#ixzz7BFN1liY8>

► <https://www.newscientist.com/article/2124366-forget-snow-rain-will-become-main-precipitation-in-the-arctic/>

'Rain has fallen on the summit of Greenland's huge ice cap for the first time on record. Temperatures are normally well below freezing on the 3,216-metre (10,551ft) peak, and the precipitation is a stark sign of the climate crisis.

Scientists at the US National Science Foundation's summit station saw rain falling throughout 14 August but had no gauges to measure the fall because the precipitation was so unexpected. Across Greenland, an estimated 7bn tonnes of water was released from the clouds.

The rain fell during an exceptionally hot three days in Greenland when temperatures were 18C higher than average in places. As a result, melting was seen in most of Greenland, across an area about four times the size of the UK.'

► <https://www.theguardian.com/world/2021/aug/20/rain-falls-peak-greenland-ice-cap-first-time-on-record-climate-crisis>

Amazon – From Blue Carbon Sink to Carbon Source

- 'Amazonia as a carbon source linked to deforestation and climate change'

'Amazonia hosts the Earth's largest tropical forests and has been shown to be an important carbon sink over recent decades. This carbon sink seems to be in decline, however, as a result of factors such as deforestation and climate change'

- Gatti, L.V., Basso, L.S., Miller, J.B. *et al* (2021). Amazonia as a carbon source linked to deforestation and climate change. *Nature* **595**, 388–393. <https://doi.org/10.1038/s41586-021-03629-6>. <https://www.nature.com/articles/s41586-021-03629-6>
- See also <https://public.wmo.int/en/media/news/role-of-amazon-carbon-sink-declines-nature-study>

Bangladesh and Pacific Island vulnerable particularly Tuvalu

Case Study Bangladesh

Scholarly Article

'Climate change is disrupting traditional rain patterns—droughts in some areas, unexpected deluges in others—and boosting silt-heavy runoff from glaciers in the Himalaya Mountains upstream, leading to an increase in flooding and riverbank erosion. Every year, an area larger than Manhattan washes away. Meanwhile, sea-level rise is pushing saltwater into coastal agricultural areas and promising to permanently submerge large swaths.

Over the last decade, nearly 700,000 Bangladeshis were displaced on average each year by natural disasters, according to the Internal Displacement Monitoring Centre. That number spikes in years with catastrophic cyclones, like 2009's Aila, which displaced millions of people and killed more than 200. But even in relatively calm years, there is a rising drumbeat of displacement as sea-level rise, erosion, salinity intrusion, crop failures, and repeat inundation make life along the coast untenable.

Overall, the number of Bangladeshis displaced by the varied impacts of climate change could reach 13.3 million by 2050, making it the country's number-one driver of internal migration, according to a March 2018 World Bank report.

'Today, city planners, policymakers, scientists, and farmers are reinforcing embankments, innovating home design, rebuilding communities, building shelters, and cultivating salt-tolerant rice seeds, among other actions. But they're moving too slowly to help many people like Golam, who survived a series of catastrophic storms only to find that migration was the only viable path remaining.'

'1971, the population was 91 percent rural. But as the country began to pivot from an agricultural economy to one diversified into manufacturing and other urban industries, Dhaka exploded. Today, nearly one-third of the population lives in cities'

'So far, local officials have invested in two flood-control gates; a freshwater treatment and distribution system that Alauddin says has increased the number of houses with running water from one-third of the city's total to one-half; eleven kilometers of pedestrian-friendly riverside brick pathways; two dozen closed-circuit security cameras; a citywide loudspeaker system that can announce inclement weather and broadcast motivational pop music; and four thousand shade trees'

'Mintu estimates that the high tide is rising by one foot per year on average, and that one-third of the village's farmable acres have been rendered useless by salinity. Farmers are reluctant to bring more than a fraction of their useable acres into cultivation, for fear of seeing their entire nest egg washed away at once and local banks, seeing the same risk, are stingy with loans. As a result, up to two-thirds of the village's men, including Golam, have left to find work in Dhaka and other cities either temporarily or for good.'

Tim McDonnell (2019), 'Climate change creates a new migration crisis for Bangladesh', National Geographic, <https://www.nationalgeographic.com/environment/article/climate-change-drives-migration-crisis-in-bangladesh-from-dhaka-sundabans>

<https://www.bbc.com/news/science-environment-59114449>



Tuvalu – Case Study

'This paper aims to scrutinize the impact of climate change in Tuvalu, which is ranked as the world's fourth smallest country. Tuvalu has only 26 km² of land area with a marine surface area of 750,000 km². It is inhabited by 11,000 people and 90% of the population depends on tourism, shipping transport and catching fish, shrimps and also extracting other sea-based products for their survival. The complexity of the local problems is also increased with the dramatic decline of the water supply in the area which restricts the local populace in meeting their basic needs of drinking, cooking, and nourishing their agricultural products. The saline water intrusion has, moreover, been putting the local population into an unhealthy lifestyle. As the island city is relatively small, people have difficulty in escaping from the zone, as the inter-island transportation is infrequent. In 1994 Tuvalu was declared by United Nations Framework Convention on Climate Change as one of the critical Pacific Islands that may face an immediate reduction in land area and their national governor was warned to prepare for evacuation of the population to neighboring countries.'

Dialnet-DancingWithApocalypse-5756096.pdf

We are not coping

Shown through:

- Committed warming we have to mitigate and adapt to which continues to accumulate
- Grave projections for the future in the US and Australia
 - Loss of military in around 20 years trying to cope with disasters
 - Loss of social fabric

Army, Defense Intelligence Agency, and NASA

'According to a new U.S. Army report, Americans could face a horrifically grim future from climate change involving **blackouts, disease, thirst, starvation and war**. The study found that the **US military itself might also collapse**. This could all happen over the next two decades, the report notes.

The senior US government officials who wrote the report are from several key agencies including the Army, Defense Intelligence Agency, and NASA. **The study called on the Pentagon to urgently prepare for the possibility that domestic power, water, and food systems might collapse due to the impacts of climate change as we near mid-century**.'

https://www.vice.com/en_au/article/mbmkz8/us-military-could-collapse-within-20-years-due-to-climate-change-report-commissioned-by-pentagon-says, 25 October 2019

['Implications of Climate Change for the U.S. Army', was **launched** by the U.S. Army War College in partnership with NASA in May]

https://climateandsecurity.files.wordpress.com/2019/07/implications-of-climate-change-for-us-army_army-war-college_2019.pdf

Global Warming

Unregulated people movements, uninhabitable areas, unfarmable areas, regional relocations, changing rainfall patterns, and water wars

- **'The US military and intelligence community and the Australian military and intelligence community has recognized climate change as a significant threat to national security –** they've recognized that for many years, they've actually been ahead of the political discussion.
- A long time ago now, almost 20 years ago **I was involved in the intelligence community here in Canberra, and I was involved in what we call transnational issues and the changing climate was one of the things we were thinking about 20 years ago well ahead of the political discussion**
- Concerned about the **likelihood of unregulated people movements** on account of the changing climate, **some areas become uninhabitable, some farming areas become unfarmable**, the **prospect of whole regions having to relocate, prospect of water wars between countries as changing rainfall patterns.**
- Another really important dimension to this...**When you've got the CIA talking about climate change is a threat to national security and a threat to global stability** you would think politicians would again sit up in their chair, but they don't.'
- Andrew Wilkie, MP

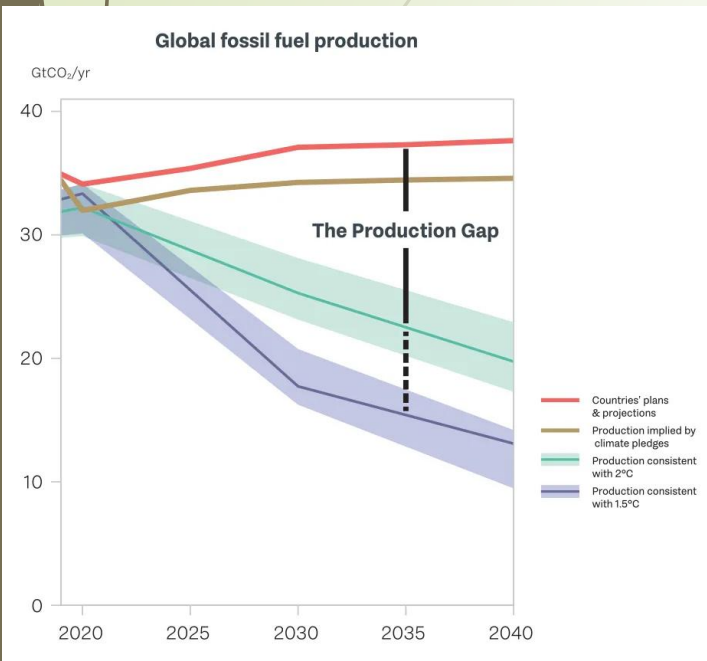
United Nations '2021 Production Gap Report'

- 'The 2021 Production Gap Report provides country profiles for 15 major producer countries: Australia, Brazil, Canada, China, Germany, India, Indonesia, Mexico, Norway, Russia, Saudi Arabia, South Africa, the United Arab Emirates, the United Kingdom, and the United States. The country profiles show that most of these governments continue to provide significant policy support for fossil fuel production.'

'The report's main findings include:

- The world's governments plan to produce around **110% more fossil fuels in 2030** than would be consistent with limiting warming to **1.5°C**, and **45% more than consistent with 2°C**. The size of the production gap has remained largely unchanged compared to our prior assessments.
- Governments' production plans and projections would lead to about 240% more coal, 57% more oil, and 71% more gas in 2030 than would be consistent with limiting global warming to 1.5°C.
- Global gas production is projected to increase the most between 2020 and 2040 based on governments' plans. This continued, long-term global expansion in gas production is inconsistent with the Paris Agreement's temperature limits.
- Countries have directed **over USD 300 billion in new funds towards fossil fuel activities** since the beginning of the COVID-19 pandemic — more than they have towards clean energy.'

[<https://www.unep.org/news-and-stories/press-release/governments-fossil-fuel-production-plans-dangerously-out-sync-paris>]





Full NDC Synthesis Report: Some Progress, but Still a Big Concern

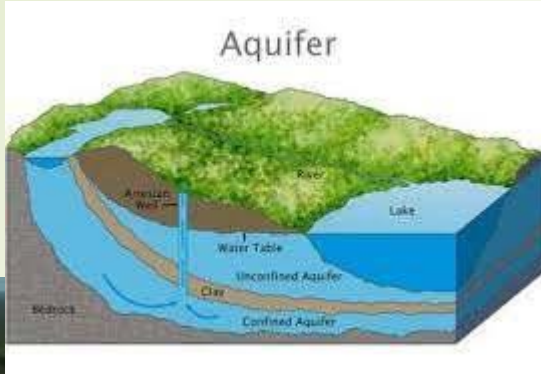
- *'The report also contains some worrying findings. The available NDCs of all 191 Parties taken together imply a sizable increase in global GHG emissions in 2030 compared to 2010, of about 16%. According to the latest IPCC findings, such an increase, unless actions are taken immediately, may lead to a temperature rise of about 2.7C by the end of the century.'*
- <https://unfccc.int/news/full-ndc-synthesis-report-some-progress-but-still-a-big-concern>



U.N. report says world 'way off' key climate target after record CO2 rise in 2020

- The World Meteorological Organization laid out the observations in its Greenhouse Gas Bulletin, which says carbon dioxide levels rose to 413.2 parts per million last year, which was higher than the average rate between 2011 and 2020.
- The temporary decline in global emissions last year driven by COVID-19 restrictions had little to no impact at all on the long-term forecast, the report said.
- https://www.upi.com/Top_News/World-News/2021/10/25/un-wmo-climate-change-emissions-greenhouse-gases/4771635165654/

Fossil Fuel Impacts



CSG salt pond



Coal Ash Dam



- CSG impacts on Farmers (impacts on bore water and through insurance issues with csg infrastructure and climate)
- Water drawdown concerns on the water tables
- Water depletion and chemical impact concerns to aquifers (Great Artesian basin)
- Methane leaks from operations (Texas and North Sea)
- Millions of abandoned wells (oil/gas) leaving forever gas/oil well maintenance and leak issues to someone else
 - <https://www.bloomberg.com/news/features/2020-09-17/abandoned-gas-wells-are-left-to-spew-methane-for-eternity>
 - <https://www.hindustantimes.com/world-news/millions-of-abandoned-oil-wells-are-leaking-methane-a-climate-menace/story-7FNtTOLeXNCarHoEpgfuM.html>
- Permafrost craters
 - <https://phys.org/news/2020-06-methane-scientists-gaping-permafrost-crater.html>
 - See also Siberian Permafrost <https://www.resilience.org/stories/2019-01-21/the-most-dangerous-climate-feedback-loop-is-speeding-up/>
- Chemicals concerns throughout the csg process
 - Extraction, processing and
 - Waste issues from coal ash dams & csg salt ponds
- Death and asthma rates around coal fired power stations
 - <https://www.greenpeace.org.au/wp/wp-content/uploads/2020/08/GPAP-Lethal-Power-full-report.pdf>
- Cancer data esp. around Lake Macquarie
 - <https://www.dailytelegraph.com.au/newslocal/central-coast/the-coast-suburbs-with-above-average-cancer-rates/news-story/710140dead388796a11fc11c622978be>
- Plastic production and pollution and forever chemicals
 - <https://whgbetc.com/petro-products.pdf>
- Cost of rehabilitation being left to the public e.g. coal mines and csg wells. Bonds shortfall of \$550 in NSW for coal mines while the Wood MacKenzie report indicates a \$76b oil/gas clean up bill with 'a good chunk to be borne by taxpayers'. Woodside paid a company to take an oil venture of their hands leaving the government to clean up
 - 'It also indicates that taxpayers are shouldering a heavy liability for mine rehabilitation, with flawed security deposit calculations leaving a shortfall of \$550M in financial bonds held by mining companies.'
https://d3n8a8pro7vhmx.cloudfront.net/lockthegate/pages/6442/attachments/original/1576729320/Mind_The_Gap_Report.pdf?1576729320
 - https://www.lockthegate.org.au/russell_vale_risk_202_million_rehabilitation_shortfall_exposes_nsw_taxpayers
 - <https://www.theguardian.com/australia-news/2020/aug/09/calls-for-woodside-to-pay-200m-to-clean-up-moribund-timor-sea-oil-site-it-ran-until-2016>
 - <https://www.boilingcold.com.au/australias-oil-and-gas-industry-will-create-a-76b-clean-up-bill/>
- Ocean acidification

Investigate Cancer Clusters near Coal and Gas fired power stations

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news local Express Advocate



© Torrens University Public Health Information Development Unit (PHIDU) researchers Sarah McDonald (left) and Clair Marsh analyse data on the new cancer atlas. Picture: supplied

The Coast suburbs with above average cancer rates

Richard Noone, Central Coast Gosford Express Advocate
July 19, 2017 4:02pm

WELCOME to Wyong — the cancer capital of the Central Coast where rates are 20 per cent higher overall than the state average.

Exclusive new data reveals the northern half of the Central Coast is a veritable cancer cluster with rates of all forms of the disease 20 per cent above the state average at Wyong and Watanobbi, 16 per cent higher at Blue Haven, Doyalson and Chain Valley Bay, and 14 per cent at Budgewoi to Norah Head.

The cancer figures have been made available for the first time, thanks to a three-year project by Torrens University's Public Health Information Development Unit (PHIDU) in South Australia.

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Power Stations around/near Lake Macquarie in red:

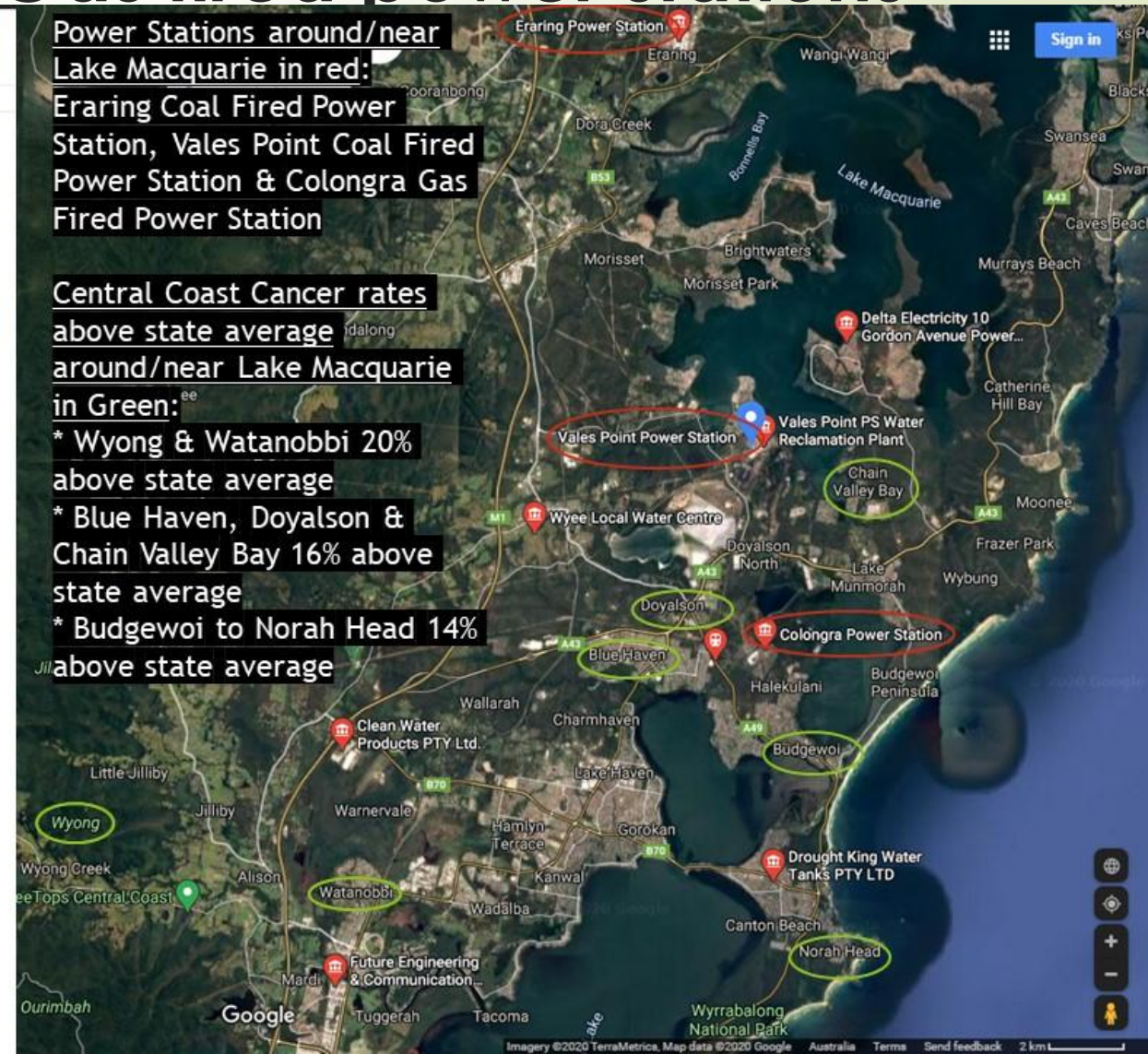
Eraring Coal Fired Power Station, Vales Point Coal Fired Power Station & Colongra Gas Fired Power Station

Central Coast Cancer rates above state average around/near Lake Macquarie in Green:

*** Wyong & Watanobbi 20% above state average**

*** Blue Haven, Doyalson & Chain Valley Bay 16% above state average**

*** Budgewoi to Norah Head 14% above state average**





Executive Summary

Lethal Power

Dr. Aidan Farrow, Andreas Anhäuser and Lauri Myllyvirta
With a preface from Professor Fiona Stanley AC FAA

GREENPEACE REPORT –

Lethal Power

How Coal is Killing People in Australia

'Much of Australia's population is in the grip of an air pollution crisis caused by emissions from coal-burning power stations. In the present study, we find that due to this toxic pollution, hundreds of Australians die every year, and even more suffer from other severe health impacts throughout their lives. We estimate that each year, air pollution from coal-burning power stations is responsible for 800 premature deaths, 850 cases of low birth weight in newborns and 14,000 asthma attacks in children and young adults aged 5-19. The death toll is eight times greater than the average annual casualty number from all natural disasters combined, and still twice as high as the exceptionally high number of deaths in the recent 2019/2020 bushfire season attributed to smoke inhalation.

Air pollution from coal-burning power stations and its harm to human health

Air pollution has serious impacts on human health. Worldwide, it is responsible for 7 million deaths each year, making it the number one environmental health risk.² Coal-burning power stations emit a large range of harmful substances, including nitrogen dioxide (NO₂), sulfur dioxide (SO₂) and fine particles (PM_{2.5}), which stay airborne for a long time and can travel hundreds of kilometers from the emitting source to surrounding populated areas. Coal burning is also a key source of the toxic heavy metals mercury (Hg), arsenic (As) and lead (Pb). The rate at which mercury is deposited from the atmosphere into the ground has risen dramatically since the industrial revolution world wide.' Page 3.

<https://www.greenpeace.org.au/research/lethal-power-how-coal-is-killing-people-in-australia/>

2021 Report on Chevron

Dr Nan Greer



CHEVRON'S **GLOBAL DESTRUCTION**

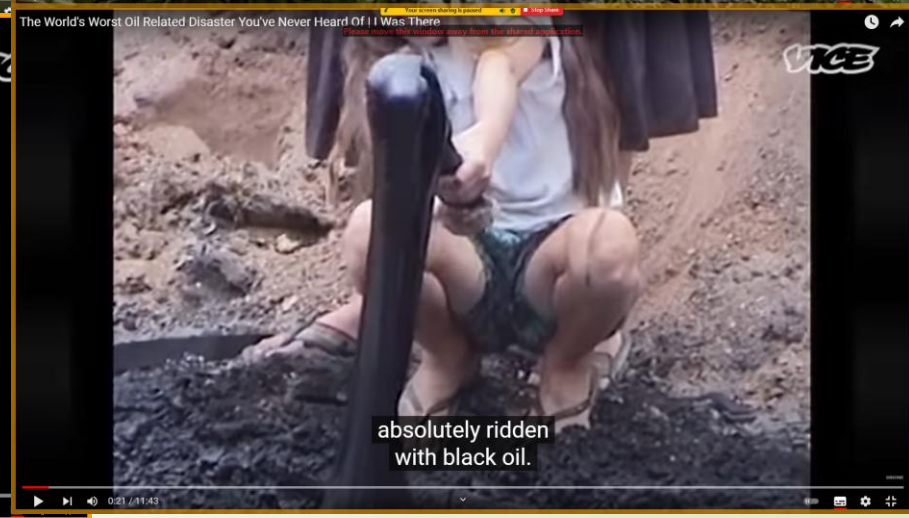
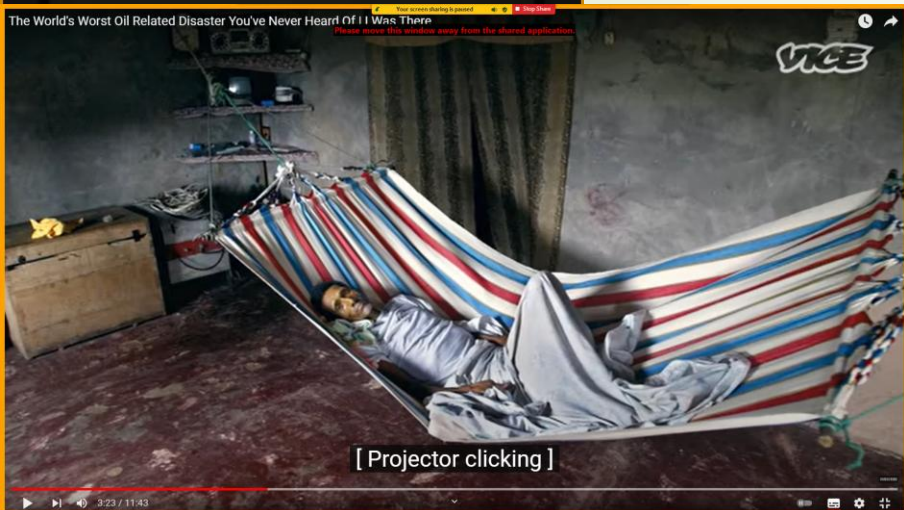
Ecocide, Genocide, and Corruption

- 'An independent expert report has determined that of the 70 ongoing cases in 31 countries against Chevron, only 0.006% (\$286-million) in fines, court judgements, and settlements have been paid. The company still owes another \$50.5-billion in total globally.
- The largest of those payout judgements is for \$9.5 billion in environmental damages representing 30,000 plaintiffs in Ecuador where the oil damage is so severe, it's known as the "Amazon Chernobyl".
- Brazil, Argentina, and Venezuela are amongst a number of countries in Africa, Asia, the Middle East, Latin America and beyond where there are ongoing litigations against Chevron. In the U.S. alone, there are 13 ongoing litigations against Chevron.
- The same day the report was released, international human rights lawyer Steven Donziger, lead attorney on the Chevron Ecuador case, was imprisoned. His incarceration came after nearly two years of house arrest in New York City and an intense legal battle for his freedom.'
- CONGRESS - Video
 - <https://news.mongabay.com/2021/10/a-new-100-page-report-raises-alarm-over-chevrons-impact-on-planet/>
 - https://chevronglobaldestruction.com/chevrons_global_destruction_report.pdf
 - Crude - <https://watchdocumentaries.com/crude-the-real-price-of-oil/>
 - Chevron v Amazon - <https://www.youtube.com/watch?v=MssnB31PmZI>

JUSTICE IN THE AMAZON

Chevron vs. The Amazon

Chevron CEO at Congress - <https://www.facebook.com/watch?v=1472924209757934>



- ▶ 11 minute video: <https://www.youtube.com/watch?v=ikneKQAeUp0>
- ▶ Chevron v Amazon: <https://www.youtube.com/watch?v=MssnB31PmZI>

Shell and Niger Delta

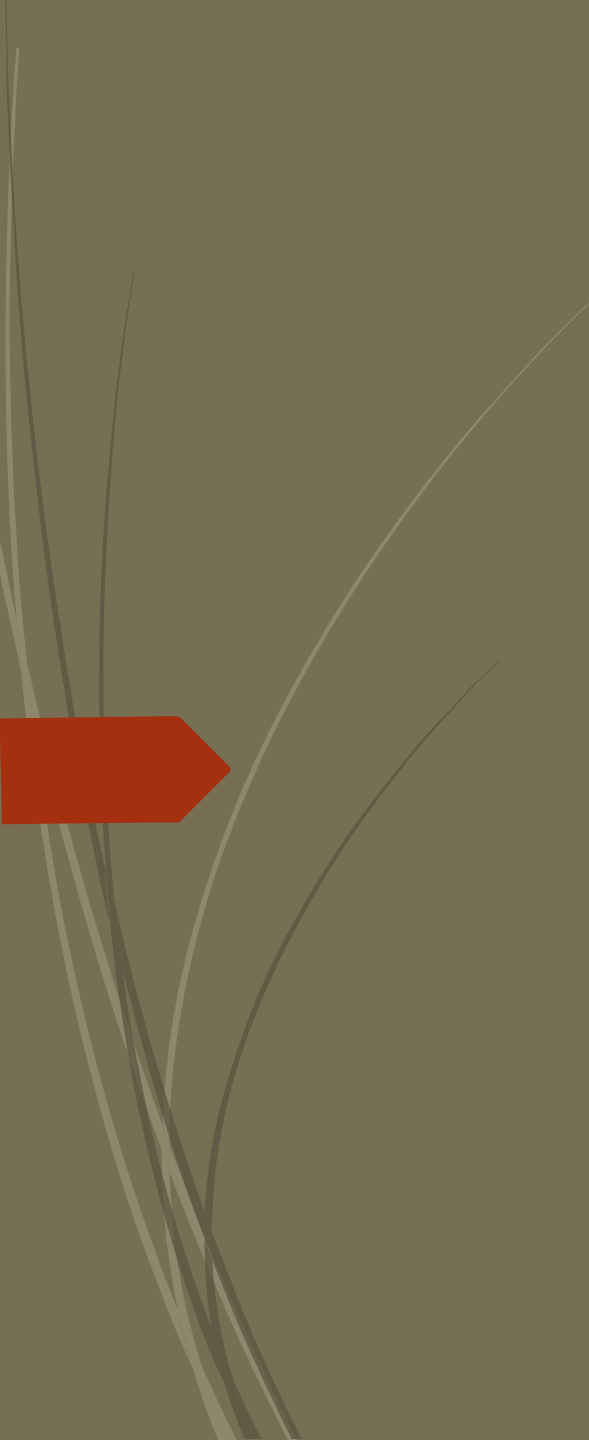
Climate of Concern - <https://vimeo.com/592784644>

8 minute video - <https://youtu.be/CVAx44XG7BE>

<https://vimeo.com/593123966>



'Shell to Pay 111M over Decades Old Oil Spills in Nigeria'
<https://www.theguardian.com/business/2021/aug/12/shell-to-pay-111m-over-decades-old-oil-spills-in-nigeria>



Solutions

A Multidisciplinary Approach

Mitigation, Adaptation, and Further
Approaches

Australia Puts Fossil Fuel Company Front and Centre at COP26

The Wrong Path



'The Australian government has been criticised for prominently hosting a fossil fuel company at its pavilion at the Cop26 climate summit in Glasgow.'

'At the front of the pavilion on Tuesday was a Santos demonstration of its Moomba carbon capture and storage project in outback South Australia. Santos confirmed on Monday that the A\$220m development would go ahead after the government announced it could receive carbon credit revenue from taxpayers through the emissions reduction fund. Australia's energy and emissions reduction minister, Angus Taylor, joined Santos' chief executive, Kevin Gallagher, at the pavilion to trumpet the announcement.'

<https://www.theguardian.com/australia-news/2021/nov/03/australia-puts-fossil-fuel-company-front-and-centre-at-cop26>

Jo Dodds (Bushfire Survivor) Reaction
https://twitter.com/BSCA_Aus/status/1455403780326010880

Gorgon – Carbon Capture and Storage

'The Gorgon Project is operated by Chevron Australia and is a joint venture of the Australian subsidiaries of Chevron (47.3 percent), ExxonMobil (25 percent), Shell (25 percent), Osaka Gas (1.25 percent), Tokyo Gas (1 percent), and JERA (0.417 percent).'

<https://australia.chevron.com/our-businesses/gorgon-project>

'Greenhouse gas emissions from Chevron's Gorgon LNG facility have increased because the company's carbon capture system is not working properly, meaning more carbon dioxide is being vented into the atmosphere.'

<https://www.theguardian.com/environment/2021/jan/15/western-australia-lng-plant-faces-calls-to-shut-down-until-faulty-carbon-capture-system-is-fixed>

'Chevron was allowed to build its \$US55 billion Gorgon LNG plant on the Barrow Island nature reserve for one reason only: to bury millions of tonnes a year of carbon dioxide from offshore reservoirs into a formation deep under the island.'

Since LNG production began in March 2016, Chevron's attempts to meet its commitments to the WA Government to inject CO₂ underground have been late, then bungled and now curtailed by a worried regulator.

The importance of CO₂ injection at Gorgon goes well beyond WA. It is the world's largest carbon capture and storage project dedicated to reducing greenhouse gas emissions, not enhancing oil recovery.

If oil and gas giant Chevron backed by its two major partners Shell and ExxonMobil, could not get it right at Gorgon more than a decade after the project was approved, then forecasts of a massive global CCS rollout before 2050 look doubtful.'

<https://www.boilingcold.com.au/times-up-on-gorgons-five-years-of-carbon-storage-failure/>

Internationally Understood Polluter Pays Principle sidelined for subsidies

- The 1972 OECD Recommendation of the Council on Guiding Principles concerning International Economic Aspects of Environmental Policies (18)
 - "The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called 'Polluter Pays Principle.' This principle means that the polluter should bear the expenses of carrying out the above mentioned measures decided by public authorities to ensure that the environment is in an acceptable state. In other words, the costs of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption. Such measures should not be accompanied by subsidies that would create significant distortions in international trade and investment." (20)
- Principle 16 of the Rio Declaration appears to confirm the internalization of negative externalities. It reads...
 - 'National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.'
- Instead of adhering to a 'polluter pays principle' governments globally appear to be subsidizing the fossil fuel industry at a rate of \$11M per minute .
- Both the UK's Sir Nicolas Stern and Australia's Ross Garnaut, well known economists, supported a carbon price.

Carbon price would make polluters pay instead of allowing negative externalities to be paid by the community. I would also provide financial aid with solutions

- The Economist (2020), 'The world urgently needs to expand its use of carbon prices'.
<https://www.economist.com/briefing/2020/05/23/the-world-urgently-needs-to-expand-its-use-of-carbon-prices>

Investment State Dispute Resolution IDSC & Energy Charter Treaty

INVESTMENT STATE DISPUTE RESOLUTION & CHEVRON

- Apart from ESD principles Chevron was taken to court for pollution in Amazon . An Ecuadorian court held Chevron liable for a \$9.5b clean up . This decision, however, has not been able to be enforced. Chevron has instead opted for further proceedings through international arbitration at the Hague under an Investment Dispute Settlement Case (IDSC) system, and further related court action in the US. The international arbitration comes under an agreement between the US and Ecuador under the 'U.S.-Ecuador Bilateral Investment Treaty which is administered by the Permanent Court of Arbitration at The Hague' . The solicitor for the landmark case has been under house arrest for over 2 years for a misdemeanor . The government in New York did not wish to prosecute Steven Donziger, yet Questions over constitutional rights have been voiced particularly related to the right to defend oneself .

IDSC & ENERGY CHARTER TREATY

- Instead of the polluter pays principle, governments are subsidizing the fossil fuel industry. In addition to this, the fossil fuel industry are suing governments attempting to address climate change in an international tribunal system utilizing international treaties. The Treaty is called the Energy Charter Treaty . It is said to be a legally binding intergovernmental multi agreement . It provides for arbitration for Investment Dispute Settlement Cases within a tribunal system (IDSC) . Investment Dispute Settlement Cases can occur under Free Trade agreements utilising the Energy Charter Treaty which also provides a zombie clause allowing the treaty to be utilised up to 20 years beyond a country exiting the agreement . In general, 120 countries and one group have had disputes regarding ISDS cases . Surprisingly more cases than not in 2020 related to renewable energy proposals according to one website . Another doesn't indicate what power source the cases relate to . According to an Australian government website Australia is said to have IDSC provisions in 10 free trade agreements and 15 Investment Protection and Promotion Agreements (IPPA) .



Examples:

NEW LAW

- In France a significant law was proposed after a well known environmentalist by the name of Nicolas Hulot achieved the Ministry of Environment in 2017 . The legislation banned all fossil fuel extraction by 2040. No new extraction was to occur after this. During the consultation process the government received a letter from a solicitors firm Piwnica et Molinié, 'on behalf of Canadian oil and gas company Vermilion' threatening an Investment State Dispute Settlement process if France pursued the Hulot Law. It argued the law would be in breach of the Energy Charter Treaty. When the revised version re-appeared it was well short of a ban and instead appeared as a promotion past 2040.

COAL BAN

- RWE sued the Dutch government for 1.4billion in 2021 over the governments coal phase out. Another, Uniper is suing the government bother at national level as well as under a ISDS action .

FRACKING BAN

- Lone Pine is suing the Canadian government for \$109.8M over a fracking ban that was initiated by the community . The ISDS occurs despite the company just being in the exploratory phase and it being based in Canada. It utilised its offices in the US to undertake the legal process through the North American Free Trade Agreement (NAFTA).

NEW OIL BANS

- Rockhopper is suing the Italian government for \$350M after investing only \$40-\$50M over a ban on new oil and gas near the coast due to 'environmental and earthquake concerns and community impacts . The ISDS case utilised the Energy Charter Treaty despite Italy withdrawing from the Treaty. This was due to a zombie clause which allows countries to be sued up to 20 years from when a country withdraws.

COP26 Coal, Methane, and Deforestation Pledges

Coal Pledge

'Dozens of nations have pledged to phase out the use of coal-fired power in a deal at the COP26 climate summit, but Australia is not on the list.

Britain has said one of its main aims for the United Nations summit is "consigning coal power to history".

The deal saw 23 nations making new commitments, a move the president of the COP26 summit, Alok Sharma, said put the end of coal "in sight".

Some of the world's biggest coal-dependent nations, such as China and India, were also notable in their absence, raising the question of whether COP26 had underwhelmed on the drive to consign the most polluting fossil fuel to history.'

This announcement was bolstered with a commitment by CEOs from more than 30 financial institutions with over \$8.7 trillion of global assets – including Aviva, Schroders and Axa – committing to eliminate investment in activities linked to deforestation.

<https://www.abc.net.au/news/2021-11-04/australia-not-among-nations-to-commit-to-phase-out-coal-cop26/100596222?fbclid=IwAR2QXWG3s0OUhcoGufX-0rJSvMK2xEpUzMxdNnOeBiAwHmXGibF-xB2NAUk>

Methane Pledge

Today is also the first time a COP in recent history has hosted a major event on methane, with 103 countries, including 15 major emitters including Brazil, Nigeria and Canada, signing up to the Global Methane Pledge. This historic commitment, led by the US and EU alongside the UK COP26 presidency, equates to up to 40% of global methane emissions and 60% of global GDP.

Deforestation Pledge

'114 leaders took a landmark step forward at a convening of world leaders on forests by committing to halt and reverse forest loss and land degradation by 2030. The pledge is backed by \$12bn in public and \$7.2bn in private funding.

Countries from Canada to Russia to Brazil – which also increased its NDC yesterday – China, Colombia, Indonesia and the Democratic Republic of the Congo all endorsed the Glasgow Leaders' Declaration on Forest and Land Use.

Together, they support 85% of the world's forests, an area of over 13 million square miles which absorbs around one third of global CO2 released from burning fossil fuels each year.'

<https://unfccc.int/news/world-leaders-kick-start-accelerated-climate-action-at-cop26>

Global Warming and Global Instability: Hunger, poverty and conflict

U.S. Department of Defense (DoD) 2014 Climate Change Adaptation Roadmap

- Today, the Department of Defense (DoD) released its 2014 Climate Change Adaptation Roadmap, which focuses on various actions and planning the DoD is taking to increase its resilience to the impacts of climate change.

"Among the future trends that will impact our national security is climate change," said Secretary of Defense Chuck Hagel. "Rising global temperatures, changing precipitation patterns, climbing sea levels, and more **extreme weather events will intensify the challenges of global instability, hunger, poverty, and conflict**. By taking a proactive, flexible approach to assessment, analysis, and adaptation, the Defense Department will keep pace with a changing climate, minimize its impacts on our missions, and continue to protect our national security."

[US Department of Defense (2014), 'DoD Releases 2014 Climate Change Adaptation Roadmap'.
<https://www.defense.gov/Newsroom/Releases/Release/Article/605221/>]

Military - Global Warming Legislation – Defence towards Disaster Response

Defence Legislation Amendment (Enhancement of Defence Force Response to Emergencies) Bill 2020

- *'Amends the: Defence Act 1903 to: **streamline the process for calling out members of the Australian Defence Force (ADF) Reserves, including for the purposes of responding to natural disasters or emergencies**; and provide ADF members, other Defence personnel and members of foreign forces with immunity from criminal or civil liability in certain cases while performing duties to support civil emergency and disaster preparedness, recovery and response; Defence Reserve Service (Protection) Act 2001 to ensure that Reserve members who are subject to a Reserve Call Out Order will continue to receive the existing protections; and Australian Defence Force Cover Act 2015, Australian Defence Force Superannuation Act 2015 and Military Superannuation and Benefits Act 1991 to ensure that Reserve members rendering continuous full-time service will receive the same entitlement to superannuation and related benefits regardless of whether it was voluntary or not.'*



Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, IPCC

- “The good news is that some of the kinds of actions that would be needed to limit global warming to 1.5°C are already underway around the world, but they would need to accelerate,” said Valerie Masson-Delmotte, Co-Chair of Working Group I.
- **The report finds that limiting global warming to 1.5°C would require “rapid and far-reaching” transitions in land, energy, industry, buildings, transport, and cities.** Global net human-caused emissions of carbon dioxide (CO₂) would need to fall by about 45 percent from 2010 levels by 2030, reaching ‘net zero’ around 2050. This means that any remaining emissions would need to be balanced by removing CO₂ from the air.

[Intergovernmental Panel on Climate Change (2014), ‘Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by Governments’, United Nations.
https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf]



#EXXONKNEW, #SHELLKNEW, #TOTALKNEW ACTED CONTRARY

'This **paper assesses whether ExxonMobil Corporation has in the past misled the general public about climate change.** We present an empirical document-by-document textual content analysis and comparison of 187 climate change communications from ExxonMobil, including peer-reviewed and non-peer-reviewed publications, internal company documents, and paid, editorial-style advertisements ('advertorials') in The New York Times.'

'**Available documents show a discrepancy between what ExxonMobil's scientists and executives discussed about climate change privately and in academic circles and what it presented to the general public.**'

Geoffrey Supran and Naomi Oreskes 2017. 'Assessing ExxonMobil's climate change communications (1977–2014)'. *Environ. Res. Lett.* 12 084019.
<https://iopscience.iop.org/article/10.1088/1748-9326/aa815f>

- See also: Christophe Bonneuil, Pierre-Louis Choquet, Benjamin Frantaca 2021. 'Early warnings and emerging accountability: Total's responses to global warming', 1971–2021 *Global Environmental Change*.
<https://www.sciencedirect.com/science/article/pii/S0959378021001655>

hybrid gas-electric Toyota Cressida to Japan. It was outfitted with Exxon's technology that enabled use of an AC (alternating current) motor in a hybrid—cheaper, smaller and more reliable than DC (direct current) motors.



The Exxon automotive team (L-R John Corcoran, David McCalvin, Luciano Forte and Bernard Dennison) stands in front of the Toyota Cressida that was delivered to Japan. (Courtesy: Keith Dennison)

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Technology Suppression?

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insidemotorsnews.org/wp-content/uploads/2016/10/CordobaBrochureExxonHybridCarTechnology.pdf

CordobaBrochureExxonHybridCarTechnology.pdf



The EEI Electrocharger™ converts dc to ac

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nissan-global.com/EN/HERITAGE/tama_electric.html

NISSAN MOTOR CORPORATION

Nissan Heritage Collection

No.009

Tama Electric Car (1947 : E4S-47-1)

Electric Vehicle

Specifications

- Overall length / width / height
3,035/1,230/1,630mm
- Wheelbase
2,000mm
- Curb weight
1,100kg
- Seating capacity
4
- Cruising range per charge
65km
- Motor (36V)
DC series-wound, rated at 3.3kW (4.5hp)
- Batteries (capacity)
Lead-acid battery (40V/162Ah)
- Top speed (economical speed)
35km/h (28km/h)

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High resolution image 2,400x1,800px
Low resolution image 640x480px

Related information

[shortStory]
Tama electric vehicles.



"TAMA" is an electric vehicle developed by Tokyo Electro Automobile Co. (later becomes "Prince Motors, Ltd.") that was a spin-off of Tachikawa Aircraft. When this car first rolled out in 1947, Japan was suffering from an acute shortage of oil, goods and food while the supply of electricity had a surplus since there were almost no home appliances

CordobaBrochureExxonHybridCarTechnology.pdf

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1968



Well Roy Doring, you've designed and built the electric engine that

Electric Car Patents in 1960's

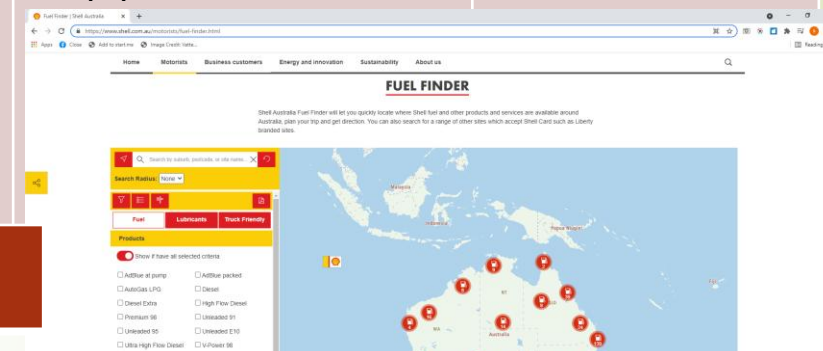
'The patent records were among a new trove of documents published on Thursday by the [Center for International Environmental Law](#), and deepen the legal and public relations challenge for Exxon.

"What we saw was an array of patent technologies that demonstrated that these companies had the technologies they needed and could have commercialised to help address the problem of CO2 pollution," said Carroll Muffett, president of the Ciel. "They then turned to Congress and said you don't need to invest in electrical vehicle research because the research is ongoing and it's robust."

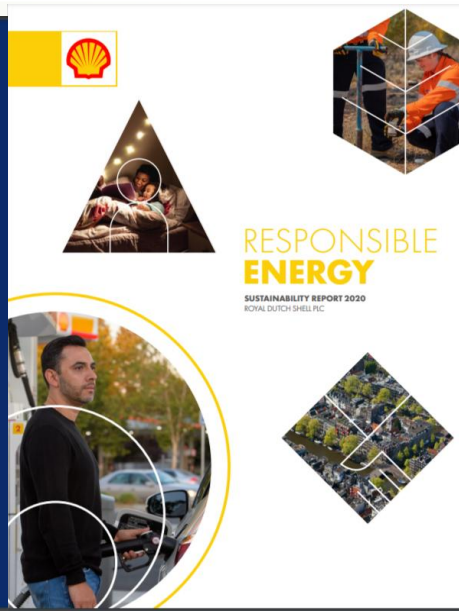
The findings echo those in the documentary [Who Killed the Electric Car?](#), which explored the deliberate destruction of GM's first electric vehicles.'

<https://www.theguardian.com/business/2016/may/20/oil-company-records-exxon-co2-emission-reduction-patents>

Company	Climate Report	Sustainability Report	Science Acceptance	Paris Agreement	Service Stations
Chevron	Yes Climate change resilience report (2021)	Yes 2020 Corporate Sustainability Report	Yes	Agree	PUMA
Shell	Yes Industry Association Climate Review 2021	Yes Sustainability Report 2020	Yes (1991 video)	Agree Dutch Court case to decrease emissions by 45% by 2030	Shell
ExxonMobil	2021 Energy & Carbon Summary		Researched & made projections Co-authored IPCC	Supports	Mobil



Institute renewables within the supply and value chains.



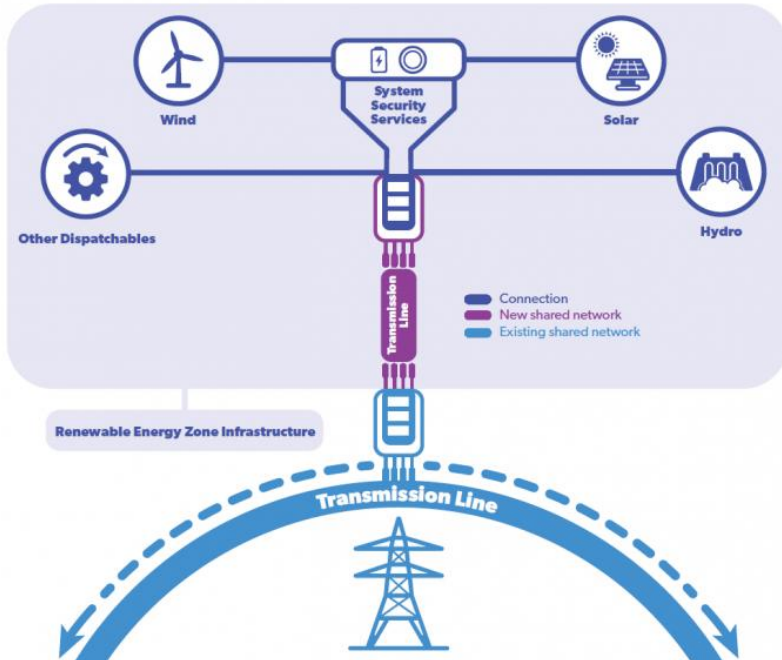
Divest from Fossil Fuels and Re-invest in Renewables

States now have

► Renewable Energy Zones (NSW and Qld)

- [New South Wales government, https://energy.nsw.gov.au/renewables/renewable-energy-zones](https://energy.nsw.gov.au/renewables/renewable-energy-zones)
- [Ben Smee \(2021\). 'Renewable revolution': Queensland to put \\$500m into clean energy fund', The Guardian. https://www.theguardian.com/australia-news/2020/sep/07/renewable-revolution-queensland-to-put-500m-into-clean-energy-fund](https://www.theguardian.com/australia-news/2020/sep/07/renewable-revolution-queensland-to-put-500m-into-clean-energy-fund)
- [Arena, 'Funding announced to kickstart NSW renewable energy zone', 23 Jun 2020, https://arena.gov.au/blog/funding-announced-to-kickstart-nsw-renewable-energy-zone](https://arena.gov.au/blog/funding-announced-to-kickstart-nsw-renewable-energy-zone)
- [Queensland Government, Renewable Energy Zones, https://www.epw.qld.gov.au/about/initiatives/renewable-energy-zones](https://www.epw.qld.gov.au/about/initiatives/renewable-energy-zones)
- Research new energy sources – 'Zero Point Energy'
 - <https://hilo.hawaii.edu/campuscenter/hohonu/volumes/documents/Vol06x30Zero-PointEnergyandInterstellarTravel.pdf>

What is a Renewable Energy Zone?



Ecology: Blue Carbon Sinks, forests, mangroves, seaweed

► Forests –

'Establishment and management of forests to enhance the removal and storage of CO₂ from the atmosphere are recognized as major opportunities to offset the increase in anthropogenic emissions of greenhouse gases and reduce the rate of global warming.' Clear evidence of the role of forests in regulating global atmospheric CO₂ partial pressure is provided from long-term measurements made at sites isolated from local sources or sinks (Figure 1). The rates of increase of atmospheric CO₂ partial pressure in the northern (Mauna Loa, Hawaii) and southern (Baring Head, New Zealand) hemispheres over the last 50 years are closely matched. However, the amplitude of the annual variation, largely attributable to seasonal changes in removal of CO₂ from the atmosphere and storage in forest biomass, is more marked in the northern hemisphere compared with the southern hemisphere. This is because of the much larger forest area in the northern hemisphere and differences in the distribution of forests in relation to seasonal changes in temperature between hemispheres.'

- David Whitehead (2011), 'Forests as carbon sinks—benefits and consequences', *Tree Physiology*, Volume 31, Issue 9. Pages 893–902, <https://doi.org/10.1093/treephys/tpr063>, Published: 26 August 2011 Article history <https://academic.oup.com/treephys/article/31/9/893/1676008>

► Mangroves (coastal extension of wetlands with trees)

- **'Carbon fixed by vegetated coastal ecosystems (blue carbon) can mitigate anthropogenic CO₂ emissions'**, though its effectiveness differs with the spatial scale of interest. A literature review compiling carbon sequestration rates within key ecosystems confirms that blue carbon ecosystems are the most efficient natural carbon sinks at the plot scale, though some overlooked biogeochemical processes may lead to overestimation.'
- Pierre Taillardat, Daniel A. Friess and Massimo Lupascu (2018), 'Mangrove blue carbon strategies for climate change mitigation are most effective at the national scale'. *The Royal Society Publishing*. <https://doi.org/10.1098/rsbl.2018.0251>

Emerging and Growing Environmental Law

‘Rights for Nature’ and ‘Environmental Personhood’

Country	Nature	Reason	Process	Guardianship
New Zealand	River (Whangai River), Park (Te Urewera), Mountain (Mount Taranaki)	Reconciliation with Maori	Legislation Te Urewera Act 2014 , Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 , Te Anao Pūtakerongo – Record of Understanding 2017	Personhood through First Nations & government
Bolivia	Mother Earth	Pollution	Legislation (The Law of the Rights of Mother Earth 2010) in response to constitutional change in 2009	System based on Andean spiritual world where environment and Earth Mother are at the centre equal to humans Enforcement through Mother Earth Ombudsman and Plurinational Mother Earth Authority.
Australia	Yarra River as ‘living entity’	First Nations voice	State Legislation (Yarra River	First Nations & Government
US	Lake Erie	Pollution?	Bill	Challenged by agribusiness
Ecuador	Pacha Mama or Earth Mother	Pollution	Constitution	Implementation could be an issue due to a lack of funding
Bangladesh	Rivers	Pollution	Supreme Court	National River Conservation Commission and National River Commission Act 12(a)
India	Rivers (Ganges and Yamuna)	Pollution	High Court	Guardianship went to state who then challenged it arguing its impracticality
Columbia	Amazon Ecosystem	Pollution	Supreme Court	Narino Government, which is part of the Colombian government, is guarantor and advocate
	Rio Atrato River	Pollution?	Constitutional Court	
Canada	Magpie River		Twin Resolutions between local council and First Nations Council	Custodian
State of Mexico City	Rights of Nature		Constitution	A secondary law will act to recognize and regulate protection See Article 13
White Earth Band of Ojibwe in Minnesota	Legal rights to Wild Rice	Oil Pipeline	Tribal Court. Appeals to the approval were unsuccessful in the Court of Appeals and Supreme Court in Minnesota.	Ancestral and productive value to First Nations. Enforcement in question with development approval granted through government.
Brazil	Rights of Nature Law			
Municipality of Paudalho				
Uganda	‘Natures fundamental rights to be, evolve and regenerate’		The National Environment Act 2019	
Pennsylvania	‘Legal rights granted to town of Tamaqua’s natural community and ecosystem’			

Should Trees Have Standing ?

Christopher Stone, 1972

The idea of 'Environmental Personhood' is not new. Articles concerning 'Rights of Nature' repeatedly refer to *Christopher Stones 'Should Trees have Standing?'* published in 1972. The emphasis being the ability of nature to engage in rights through the legal system under a guardianship arrangement. Stone promoted concepts of human and nature's consciousness, along with earth as an organism, interconnectivity leaning towards the universe, the need to forgo human domination and mechanical beliefs towards nature, and the ability to manifest outcomes through discourse.

Interview with Christopher Stone prior to his passing 2021–3 minute video
<https://www.youtube.com/watch?v=eV9JmQwFXg0>

Environmental Defenders Office

- Jurisdictions across the world have taken varying approaches to grant increased legal protections to nature including legal personality for natural ecosystems and rights to nature.

Difference between Rights of Nature and Personhood

- Rights of Nature laws recognise that the living world has a right to exist, thrive and evolve and also that it is not an object or human property (in other words, it recognises that nature has a set of rights that must be respected and enforced).
- Legal personhood for nature laws, on the other hand, make certain elements in the living world, such as rivers and mountains, to have rights at law (in other words, it gives them 'standing').(3)



‘Environmental Personhood’ through understanding and guardianship of First Nations

Prophecy:

‘Upon suffering beyond suffering, the Red Nation shall rise again and it shall be a blessing for a sick world. A world filled with broken promises, selfishness and separations. A world longing for light again. I see a time of seven generations when all the colors of mankind will gather under the sacred Tree of Life and the whole Earth will become one circle again. In that day there will be those among the Lakota who will carry knowledge and understanding of unity among all living things, and the young white ones will come to those of my people and ask for this wisdom.’

Crazy Horse

Tǎšaúnke Witkó (Crazy Horse), Oglala Lakota Leader (1840-1877)

Lakota Nation

Four days before his assassination - <https://redroadproject.com/7th-generation/>

Chase Iron Eyes

<https://vimeo.com/640613754>





Legislation

- Federal Legislation, and consistent state legislation, for
 - Federal Zero Emission Targets and/or
 - Federal 100% Renewable Energy Targets
- There are state and territory acts but they are not consistent

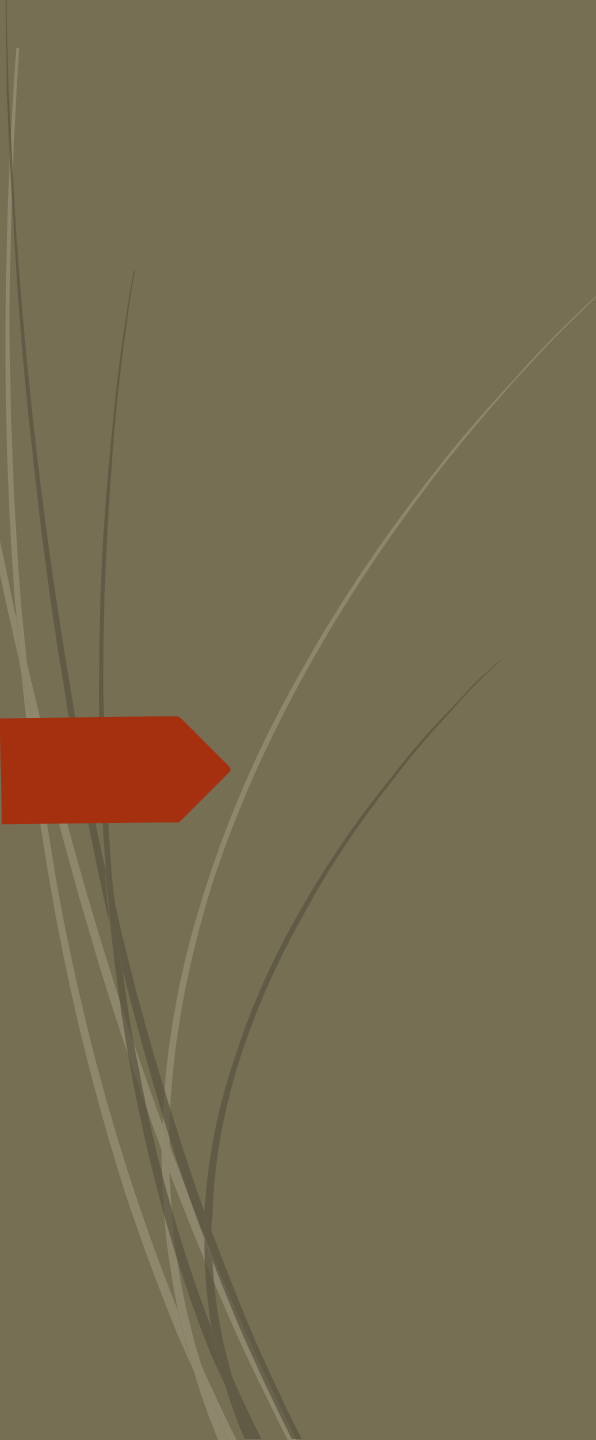
Jobs

- Beyond Zero Emissions Million Jobs Plan
 - Beyond Zero Emissions (2020). 'The Million Jobs Plan', Beyond Zero Emissions Inc. <https://millionjobs.org.au/>
- Climate Council Clean Jobs Plan
 - Alpha Beta Australia and Climate Council (2020). 'Clean Jobs Plan'. <https://www.climatecouncil.org.au/resources/clean-jobs-plan/>

Global Plan

Identify a need for, and provide, guidelines towards a global plan that includes:

- Legislative prohibition of extraction and combustion of fossil fuels and legislative promotion towards current large scale transitions in energy sources through emission/renewable energy targets and more.
- Identification of vulnerabilities towards disasters in each country.
- An understanding of the need to go beyond carbon neutrality due to long-lasting atmospheric carbon build up.
- Identification and expansion of blue carbon sink capabilities (trees, mangroves, seaweed).
- Identification and promotion of adaptation measures.
- Peacetime use of military and intelligence towards disaster response and solutions.
- First Nations inclusion and understanding of interconnectivity, healing, and respect for Mother Earth.
- Research into all possible clean energy sources.
- Develop communication and connections between all facets of society through scientists, governments, military, intelligence, businesses that includes farmers and more importantly First Nations and grassroot community groups.
- Discussions that illuminate causes, capabilities, and solutions to achieve greater self-sufficiency among nation-states and individuals based on truth. This includes energy provision, water storage and food production.
- Provide genuine provision towards a 'polluter pays principle' system, instead of subsidizing polluters, to accelerate energy transitions and rehabilitation/restoration of Mother Earth.



References

Christophe Bonneuil, Pierre-Louis Choquet, Benjamin Franta 2021. 'Early warnings and emerging accountability: Total's responses to global warming', 1971–2021 Global Environmental Change. <https://www.sciencedirect.com/science/article/pii/S0959378021001655>

Bob Berwyn (2018). 'Global Warming Is Messing with the Jet Stream. That Means More Extreme Weather', Inside Climate News, <https://insideclimatenews.org/news/31102018/jet-stream-climate-change-study-extreme-weather-arctic-amplification-temperature>. Write up relates to scholarly article MICHAEL E. MANN, STEFAN RAHMSTORF, KORNHUBERBYRON A. STEINMAN, SONYA K. MILLER, STEFAN PETRI, AND DIM COUMOU, (2018) 'Projected changes in persistent extreme summer weather events: The role of quasi-resonant amplification'. <https://www.science.org/doi/10.1126/sciadv.aat3272>

Changlin Chen¹, Guihua Wang², Shang-Ping Xie³, and Wei Liu⁴, 'Why Does Global Warming Weaken the Gulf Stream but intensify the Kuroshio?' (2019). Journal of Climate, Volume 32 Issue 21, Print Publication, DOI. <https://doi.org/10.1175/JCLI-D-18-0895.1>, Page(s): 7437–7451, <https://journals.ametsoc.org/view/journals/clim/32/21/jcli-d-18-0895.1.xml>

The Economist (2020), 'The world urgently needs to expand its use of carbon prices'. <https://www.economist.com/briefing/2020/05/23/the-world-urgently-needs-to-expand-its-use-of-carbon-prices>

Ed Yong (2014). 'Giant virus resurrected from 30,000-year-old ice', Nature. <https://www.nature.com/articles/nature.2014.14801>

Linwood Pendleton· Ove Hoegh-Guldberg· Rebecca Albright· Anne Kaup· Paul Marshall· Nadine Marshall· Steve Fletcher· Gunnar Haraldsson· Lina Hansson (2019). 'The Great Barrier Reef: Vulnerabilities and solutions in the face of ocean acidification', *Regional Studies in Marine Science*, Volume 31, 100729. <https://www.sciencedirect.com/science/article/pii/S2352485518306959>

L. Caesar, G. D. McCarthy, D. J. R. Thornalley, N. Cahill, S. Rahmstorf (2021). 'Current Atlantic Meridional Overturning Circulation weakest in last millennium'. *Nature Geoscience*. DOI: 10.1038/s41561-021-00699-z, on page Potsdam Institute for Climate Impact Research (PIK). (2021), "Gulf Stream System at its weakest in over a millennium." *ScienceDaily*. <https://www.sciencedaily.com/releases/2021/02/210225113357.htm>

Margaret Rosso Grossman (2018). 'Climate Change and the Individual', *The American Journal of Comparative Law*, Volume 66, Issue suppl_1, Pages 345–378. <https://doi.org/10.1093/ajcl/avy018> and https://academic.oup.com/ajcl/article/66/suppl_1/345/5035883

Shira Houwenhuyse, Emilie Macke, Lien Reyserhove, Lore Bulteel, and Ellen Decaestecker (2018). 'Back to the future in a petri dish: Origin and impact of resurrected microbes in natural populations', *Evol Appl.*, ppg. 29-41. Published online (2017) doi: 10.1111/eva.12538 at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5748525/>

The Economist (2020). 'The world urgently needs to expand its use of carbon prices'. <https://www.economist.com/briefing/2020/05/23/the-world-urgently-needs-to-expand-its-use-of-carbon-prices>

Tim McDonnell (2019). 'Climate change creates a new migration crisis for Bangladesh', *National Geographic*. <https://www.nationalgeographic.com/environment/article/climate-change-drives-migration-crisis-in-bangladesh-from-dhaka-sundabans>

Geoffrey Supran and Naomi Oreskes 2017. 'Assessing ExxonMobil's climate change communications (1977–2014)'. *Environ. Res. Lett.* 12 084019. <https://iopscience.iop.org/article/10.1088/1748-9326/aa815f>

Timothy M. Lenton , Johan Rockström , Owen Gaffney , Stefan Rahmstorf , Katherine Richardson , Will Steffen & Hans Joachim Schellnhuber (2019). 'Climate Tipping Points – Too Risky to Bet Against', *Nature* 575, 592–595. <https://www.nature.com/articles/d41586-019-03595-0>

(2016) "What Lies Beneath" in *Scientific American* 315, 5, 11–12, doi:10.1038/scientificamerican1116-11 at <https://www.scientificamerican.com/article/as-earth-warms-the-diseases-that-may-lie-within-permafrost-become-a-bigger-worry/>

Reports - Scholarly IPCC Reports and others

Alpha Beta Australia and Climate Council (2020), Clean Jobs Plan,
<https://www.climatecouncil.org.au/resources/clean-jobs-plan/>

Australian Government (2020). 'State of the Climate 2020', Bureau of Meteorology,
<http://www.bom.gov.au/state-of-the-climate/>.

Australian Government (2018). 'Traditional Owners of the Great Barrier Reef: The Next Generation of Reef 2050 Actions Final Report From The Reef 2050 Traditional Owner Aspirations Project'. <https://www.environment.gov.au/system/files/resources/7b495328-8097-4aab-84aa-67b2a9e789fb/files/reef-2050-traditional-owner-aspirations-report.pdf>

Beyond Zero Emissions (2020). The Million Jobs Plan, Beyond Zero Emissions Inc.
<https://millionjobs.org.au/>

Deloitte Access Economics (2017). 'The Great Barrier Reef has an economic, social and icon asset value of \$56 billion. It supports 64,000 jobs and contributes \$6.4 billion to the Australian economy':
<https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-great-barrier-reef-230617.pdf>

Deloitte Access Economics (2021). Deloitte Access Economics, 'Special report: Update to the economic, costs of natural disasters in Australia, Australian Business Roundtable for Disaster Resilience & Safer Communities', 2021,
https://www.iag.com.au/sites/default/files/Newsroom%20PDFs/Special%20report%20_Update%20to%20the%20economic%20costs%20of%20natural%20disasters%20in%20Australia.pdf
. Media Write Up Royce Kurmelovs, 'Eye-watering': climate change disasters will cost Australia billions each year, study finds', Wed 6 Oct 2021 19.34 AEDT,
<https://www.theguardian.com/environment/2021/oct/06/eye-watering-climate-change-disasters-will-cost-australia-billions-each-year-study-finds>

Reports

Insurance Australia Group Limited (IAG) (2017). 'Natural disaster costs to reach \$39 billion per year by 2050'. <https://www.iag.com.au/natural-disaster-costs-reach-39-billion-year-2050>

Intergovernmental Panel on Climate Change (2014). 'Climate Change 2014 - Synthesis Report – Summary for Policy Makers'.
https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

Intergovernmental Panel on Climate Change (2018). 'Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by Governments'.
https://www.ipcc.ch/site/assets/uploads/2018/11/pr_181008_P48_spm_en.pdf

Intergovernmental Panel on Climate Change (2021). United Nations.
<https://www.ipcc.ch/assessment-report/ar6/>

US Department of Defense (2014). 'DoD Releases 2014 Climate Change Adaptation Roadmap'.
<https://www.defense.gov/Newsroom/Releases/Release/Article/605221/>

WHO/EHA, DISASTERS & EMERGENCIES DEFINITIONS (2002). 'Training Package, Panafrican Emergency Training Centre, Addis Ababa'. Updated (2002) by EHA,
<https://apps.who.int/disasters/repo/7656.pdf>

References: General

Alan Buis (2019). 'The Atmosphere: Getting a Handle on Carbon Dioxide: Sizing Up Humanity's Impacts on Earth's Changing Atmosphere: A Five Part Series'. NASA's Jet Propulsion Laboratory. <https://climate.nasa.gov/news/2915/the-atmosphere-getting-a-handle-on-carbon-dioxide/>

Arena (2020). 'Funding announced to kickstart NSW renewable energy zone'. <https://arena.gov.au/blog/funding-announced-to-kickstart-nsw-renewable-energy-zone>

Ben Smee, Renewable revolution: Queensland to put \$500m into clean energy fund, The Guardian, 7 Sep 2021, <https://www.theguardian.com/australia-news/2020/sep/07/renewable-revolution-queensland-to-put-500m-into-clean-energy-fund>

Exxon Memo (1982). <https://www.documentcloud.org/documents/2805576-1982-Exxon-Memo-to-Management-About-CO2>

Exxon website: <https://www.exxonmobil.com.au/Energy-and-environment/Environmental-protection/Climate-change>

Ellen Grey (2018). Unexpected future boost of methane possible from Arctic permafrost', NASA's Earth Science News Team. <https://climate.nasa.gov/news/2785/unexpected-future-boost-of-methane-possible-from-arctic-permafrost/>

Fred Pearce, 'As Climate Change Worsens, A Cascade of Tipping Points Looms', YaleEnvironment360, 5 December 2019, <https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-ooms#:~:text=The%20potential%20tipping%20points%20come,of%20the%20ocean%20circulation%20system>

NASA, 'The Study of Earth as an Integrated System' https://climate.nasa.gov/nasa_science/science/

New South Wales government, <https://energy.nsw.gov.au/renewables/renewable-energy-zones>

Queensland Government, Renewable Energy Zones, <https://www.epw.qld.gov.au/about/initiatives/renewable-energy-zones>

University of Exeter. "Nine climate tipping points now 'active,' warn scientists." ScienceDaily. ScienceDaily, 27 November 2019. <www.sciencedaily.com/releases/2019/11/191127161418.htm>.

Eurostat Statistics Explained at https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Carbon_dioxide_equivalent#:~:text=A%20carbon%20dioxide%20equivalent%20or,with%20the%20same%20global%20warming. Source: © 2019 Munich Re, Geo Risks Research, NatCatSERVICE. As of March 2019.

<https://www.gccapitalideas.com/2020/04/21/protecting-our-planet-and-the-public-purse-climate-models-uneven-impact/>

<https://www.iii.org/fact-statistic/facts-statistics-global-catastrophes>

W.Glass to R.W.Cohen (1981), Memo. Exxon <https://www.climatefiles.com/exxonmobil/1981-exxon-memo-on-possible-emission-consequences-of-fossil-fuel-consumption/>

References: General

LEGISLATION

Defence Legislation Amendment (Enhancement of Defence Force Response to Emergencies) Bill 2020,
https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bld=r6594

YouTube

Shell (1991). 'Climate of Concern'. <https://www.youtube.com/watch?v=0VOWi8oVXmo>

Press Releases

US Department of Defence (2014). 'Climate Change Adaptation Roadmap'.
<https://www.defense.gov/Newsroom/Releases/Release/Article/605221/>

General Articles:

Inverse, '7,000 UNDERGROUND GAS BUBBLES IN SIBERIA ARE ABOUT TO BURST',
<https://www.inverse.com/article/29362-siberia-bubble-methane-permafrost-explosion>

Skolkovo Institute of Science and Technology (2020). 'Here be methane: Scientists investigate the origins of a gaping permafrost crater, Phys.Org. <https://phys.org/news/2020-06-methane-scientists-gaping-permafrost-crater.html>

The Guardian (2011). 'What are the climate change feedback loops'.
<https://www.theguardian.com/environment/2011/jan/05/climate-change-feedback-loops>