Understanding and Preventing Climate Breakdown

Fabian Dablander

28th July, 2022
Outline

Part I: The Bigger Picture
Part II: Climate Emergency

Part III: Current Climate Policy
Part IV: Climate Revolution

Part V: Discussion
Part I:
The Bigger Picture
Burke et al. (2018); Brannen (2021); United Nations (2021)
Socio-economic trends

Steffen et al. (2015)
Breaking Boundaries

Rockström et al. (2009a,b); Steffen et al. (2015)
Raworth (2017)
Part II: Climate Emergency

IPCC AR6 WGI SPM; Hausfather (2017)
Every tonne of CO$_2$ emissions adds to global warming

Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO$_2$ emissions (GtCO$_2$)

The near linear relationship between the cumulative CO$_2$ emissions and global warming for five illustrative scenarios until year 2050

Historical global warming

Cumulative CO$_2$ emissions since 1850

IPCC AR6 WGI SPM  Allen et al (2009); Peters (2019)
<table>
<thead>
<tr>
<th>Approximate global warming relative to 1850–1900 until temperature limit (°C)*(^{(1)})</th>
<th>Additional global warming relative to 2010–2019 until temperature limit (°C)</th>
<th>Estimated remaining carbon budgets from the beginning of 2020 (GtCO(_2))</th>
<th>Variations in reductions in non-CO(_2) emissions*(^{(3)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>0.43</td>
<td>900</td>
<td>Higher or lower reductions in accompanying non-CO(_2) emissions can increase or decrease the values on the left by 220 GtCO(_2) or more</td>
</tr>
<tr>
<td>1.7</td>
<td>0.63</td>
<td>1450</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>0.93</td>
<td>2300</td>
<td></td>
</tr>
</tbody>
</table>

\(^{(1)}\) Allen et al (2009); Peters (2019)
Limiting warming to 1.5°C is increasingly difficult without large-scale negative emissions.

Pathway to 1.5°C given cumulative emissions in 2000.

Pathway to 1.5°C given cumulative emissions in 2021.

Hausfather (2021)  
Rockström et al. (2017)
Climate impacts emerge earlier and are worse than anticipated
Hourly Temperature, Concordia Station, Antarctica

Record High
18 March 2022

Median average 2013-2021
“[T]here is something else going on with this heatwave, and indeed, with many of the very persistent weather extremes we’ve seen in recent years in the US, Europe, Asia and elsewhere, where the models aren’t quite capturing the impact of climate change.”

- Michael Mann

“The recent extreme weather anomalies were not represented in global computer models that are used to project how the world might change with more emissions.”

- Johan Rockström
How much warming above pre-industrial times do you think is likely by 2100?

- 1.5 °C: 5%
- 2 °C: 10%
- 2.5 °C*: 20%
- 3 °C: 45%
- 3.5 °C: 5%
- 4 °C: 10%

*Includes 2 responses between 2.7 °C and 2.75 °C; 2.5 °C and 3.5 °C were write-in answers.

Tollefson (2021)
The Uninhabitable Earth

Famine, economic collapse, a sun that cooks us: What climate change could wreak — sooner than you think.

By David Wallace-Wells
Nine climate “tipping points” where rising global temperatures could push parts of the Earth system into irreversible change.

**Tipping Points**

- **Greenland ice sheet disintegration**
  - Irreversible retreat of the ice sheet caused by rising temperatures
  - Sea level rise (2-7m)

- **Permafrost loss**
  - Abrupt increase in emissions of CO2 and methane through the thawing of frozen carbon-rich soils
  - Greenhouse gas release
  - Amplified warming
  - Regional cooling
  - Sea level rise

- **Atlantic meridional overturning circulation breakdown**
  - Shutdown of the AMOC caused by an increased influx of freshwater into the North Atlantic
  - Ecological shift
  - Regional warming

- **Boreal forest shift**
  - A shift in boreal forests, seeing expansion into tundra to the north and dieback to the south
  - Ecological shift
  - Regional warming

- **West Antarctic ice sheet disintegration**
  - Collapse of the ice sheet triggered by persistent grounding-line retreat in one sector, cascading to other sectors

- **Amazon rainforest dieback**
  - Deforestation and hotter, drier conditions causing dieback of the rainforest and a shift towards savannah
  - Decreased rainfall

- **West African monsoon shift**
  - An abrupt change in Sahel rainfall, caused by a shift northwards (wetter) or southwards (drier) in the West African monsoon
  - Decreased carrying capacity
  - Drought

- **Indian monsoon shift**
  - The monsoon system could be weakened by higher aerosol emissions or strengthened by rising CO2 emissions

- **Coral reef die-off**
  - Rising temperatures pushing corals beyond tolerable levels of thermal stress into an alternative state dominated by macroalgae

**Source**

Carbon Brief
Ritchie et al. (2020)
Lenton et al. (2019)
Wunderling et al. (2021)
McKay et al. (under review)
“The evidence from tipping points alone suggests that we are in a state of planetary emergency.”

- Lenton et al. (2019)
“Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all.”
“What we do over the next three to four years, I believe, is going to determine the future of humanity.”

Sir David King (2021)
Part III:
Current Climate Policy
Fossil Fuelled Lies

Society’s Understanding & Actions

Big Oil’s Understanding & Actions

Franta (2018a,b); Franta (2021a,b); Farrell (2016); Supran & Oreskes (2017,2021a,b); McKibben (2015); Bonneuil et al. (2021); Franta & Supran (2017)
## Society’s Understanding & Actions

- 1960: Keeling shows increase in CO2
- 1965: Environmental Report Lyndon Johnson
- 1970s: Cooling or Warming? Warming!
- 1988: Hansen testifies before Congress
- 1988: IPCC forms
- 1992: UNFCCC
- 1997: Kyoto Protocol signed
- 2015: Paris Agreement

## Big Oil’s Understanding & Actions

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## Big Oil’s Understanding & Actions

- 1959: Edward Teller warns Big Oil
- 1965: President of API warns Big Oil
- 1979-83: Exxon internal research programme
- 1980: API argues for tripling coal
- 1987: IPIECA Strategy meeting
  - Emphasise uncertainties
  - Stress the cost of action
  - Focus on policies that do not threaten fossil fuels
  - Insist on ‘detection before action’
- 1989-2002: Global Climate Coalition
- 2000-now: Greenwashing

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Franta (2018a,b); Franta (2021a,b); Farrell (2016); Supran & Oreskes (2017,2021a,b); McKibben (2015); Bonneuil et al. (2021); Franta & Supran (2017)
Exclusive: Oil and gas majors are planning scores of vast projects that threaten to shatter the 1.5C climate goal. If governments do not act, these firms will continue to cash in as the world burns

by Damian Carrington and Matthew Taylor
Net zero emissions target announcements

Agreed in law, as part of an initiative, or under discussion

- Other countries with similar net zero announcements: 38%
- Countries with no net zero target: 10%
- India: 7%
- United States: 12%
- European Union (EU27): 7%
- China: 25%

Global emissions covered: 90%
Net zero target design - mostly inadequate to date
Evaluation of the quality of net zero targets using the CAT’s design blueprint for transparent, comprehensive, and robust national net zero targets

- Not covered by CAT: 15%
- Pending CAT assessment: 2%
- No target: 5%
  - Iran
  - Kenya
  - Mexico
  - Morocco
  - Philippines
  - Viet Nam
- Information incomplete: 27%
  - Argentina
  - Brazil
  - Colombia
  - India
  - Indonesia
  - Nigeria
  - Russia
  - Saudi Arabia
  - South Africa
  - Thailand
  - Turkey
  - UAE
  - Ukraine

Net zero targets with inadequate target design: 73%

- Acceptable: 6%
  - Chile
  - Costa Rica
  - EU
  - UK
- Average: 17%
  - Canada
  - Germany
  - South Korea
  - USA
- Poor: 29%
  - Australia
  - China
  - Japan
  - New Zealand

Climate Action Tracker (2021)
NET ZERO STOCKTAKE 2022

Assessing the status and trends of net zero target setting across countries, sub-national governments and companies.

June 2022
Four Reasons why Net zero by 2050 is woefully inadequate
Why net zero by 2050 is woefully inadequate

1. There is no carbon budget left for rich nations
Responsibility for climate breakdown

USA (40%)

Rest of Europe (13%)

EU-28 (29%)

Rest of Global North (10%)

Global South (8%)

Hickel (2020); Hickel & Slammersak (2022); Anderson et al. (2020)
CLIMATE COLONIALISM

Anuradha Mittal
Founder and Director of
Oakland Institute CA

Nnimmo Bassey
Former Chair of Friends of Earth International,
Director, Home of Mother Earth Foundation

Oxford Climate Society Online Events
Mon 25 Jan | 18:00 UTC | OCS YouTube Livestream

Oxford Climate Society

In-depth Q&A: What is ‘climate justice’?
Why net zero by 2050 is woefully inadequate

2. Gives us a mere 50% chance of staying within 1.5°C

Damon Matthews et al. (2021); Twitter thread
Why net zero by 2050 is woefully inadequate

3. Relies on negative emissions technology that is unproven at scale
**No quick fixes**

Modelers generally report net carbon emissions, unintentionally hiding the scale of negative emissions. Separating out the positive CO₂ emissions from fossil fuel combustion, industry, and land-use change reveals the scale of negative CO₂ emissions in the model scenarios (16). INDCs, Intended Nationally Determined Contributions.

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"Negative-emission technologies are not an insurance policy, but rather an unjust and high-stakes gamble."

- Anderson & Peters (2016)

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**Land used exclusively for removal**

- **LAND FOR CARBON REMOVAL**: 1.62bn ha
- **CROPLAND WORLDWIDE**: 1.5bn ha

*Afforestation, reforestation and BECCS

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Hickman (2016)
Sen & Dabi (2021)
Carbon Brief
Hausfather (2022)
“Current net zero policies will not keep warming to within 1.5°C because they were never intended to. They were and still are driven by a need to protect business as usual, not the climate.”
Wiedmann et al. (2020); Haberl et al. (2020); Jackson & Victor (2019); Hickel & Kallis (2019); Hickel et al. (2021); Hickel & Hallegatte (2021)
Why net zero by 2050 is woefully inadequate

4. Climate impacts are worse than predicted and accelerating
“If governments are serious about the climate crisis, there can be no new investments in oil, gas and coal, from now – from this year.”

Fatih Birol (2021)
“Governments plan to produce more than twice the amount of fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C.”
"The truly dangerous radicals are the countries that are increasing the supply of fossil fuels."

Which countries is the Secretary General of the UN referring to here?

Brace yourselves.

Climate activists are sometimes depicted as dangerous radicals.

But the truly dangerous radicals are the countries that are increasing the production of fossil fuels.

Investing in new fossil fuels infrastructure is moral and economic madness.

11:46 AM · Apr 5, 2022 · Twitter Web App
This is fine.
UN Warns of ‘Total Societal Collapse’ Due to Breaching of Planetary Boundaries

Nafeez Ahmed
26 May 2022
We need to shift into emergency mode
Government spending rose 10 fold from 1940 to 1945
National speed limit of 35 mph to conserve fuel, car sharing
Manufacturing of cars, construction of new homes banned
Rationing of gasoline, meat, butter, sugar etc.
Income taxes of up to 94%
Tipping positive change

Sensitive intervention points in the post-carbon transition
We must exploit socioeconomic tipping points and amplifiers

Social tipping dynamics for stabilizing Earth’s climate by 2050

Lenton (2019); Farmer et al. (2019); Otto et al. (2020); Hepburn et al. (2020); Winkelmann et al. (2020)
Part V: Climate Revolution
It’s easy to feel pessimistic about the climate. But we’ve got two big things on our side

*Bill McKibben*
Way et al. (2021); Roser (2020)

The price of electricity from new power plants

Electricity prices are expressed in ‘levelized costs of energy’ (LCOE). LCOE captures the cost of building the power plant itself as well as the ongoing costs for fuel and operating the power plant over its lifetime.

The price of electricity from solar declined by 89% in these 10 years.

The price of onshore wind electricity declined by 70% in these 10 years.

- Observed global average technology costs
- Probabilistic Wright’s law forecast under Fast Transition scenario (median, 50% C.I. and 95% C.I.)
- High progress IAM or IEA cost projections
- Probabilistic AR(1) forecast (median, 50% C.I. and 95% C.I.)

Data: Lazard Levelized Cost of Energy Analysis, Version 13.0
OurWorldInData.org – Research and data to make progress against the world’s largest problems. Licensed under CC-BY by the author Max Roser.
Fanning et al. (2021); O’Neill et al. (2018)

https://goodlife.leeds.ac.uk/
Carbon Inequality

Top 1%: > 94,000 € / year
Top 10%: > 32,800 € / year

Global average per capita consumption emissions target by 2030 for 1.5°C

Capstick et al. (2020)
Shift the focus from the super-poor to the super-rich

Ilona M. Otto, Kyoung Mi Kim, Nika Dubrovsky & Wolfgang Lucht

Nature Climate Change 9, 82–84 (2019) | Cite this article

4864 Accesses | 28 Citations | 1921 Altmetric | Metrics

Scientists’ warning on affluence

Thomas Wiedmann, Manfred Lenzen, Lorenz T. Keyßer & Julia K. Steinberger

Nature Communications 11, Article number: 3107 (2020) | Cite this article

171k Accesses | 107 Citations | 4550 Altmetric | Metrics

The role of high-socioeconomic-status people in locking in or rapidly reducing energy-driven greenhouse gas emissions

Kristian S. Nielsen, Kimberly A. Nicholas, Felix Creutzig, Thomas Dietz & Paul C. Stern

Nature Energy 6, 1011–1016 (2021) | Cite this article

12k Accesses | 671 Altmetric | Metrics

Otto et al. (2019); Wiedmann et al. (2020); Nielsen et al. (2021); Oswald et al. (2020)
Nielsen et al. (2021a, b, c, d)
Carbon Footprint Reduction

- Stop or lower air travel
- Stop driving petrol cars
- Reduce your meat consumption, especially beef
- Talk about it!

Ivanova et al. (2020); Steinberger (2018); Foley (2020)
• Divestment (Personal & Organizational)
• Donations to environmental organizations
• Influence through position / status

Organize lectures / workshops
High-level interventions
(Reduce meat in cafeteria, at parties, disincentivize flights, etc.)

Comment | Published: 15 March 2021

Changing scientific meetings for the better

Sarvenaz Sarabipour, Aziz Khan, Yu Fen Samantha Seah, Aneth D. Mwakillili, Fiona N. Mumok, Pablo J. Sáez, Benjamin Schwessinger, Humberto J. Debat & Tomislav Mestrovic

Nature Human Behaviour 5, 296–300 (2021) | Cite this article

7822 Accesses | 4 Citations | 249 Altmetric | Metrics

Sustainability at the UvA

We integrate sustainability into study programmes and conduct research on sustainability issues. We have also adopted a sustainable approach to our operations.
- Vote
- Talk about the climate crisis (urgency and agency)
- Contagion of low-carbon lifestyle (social norm shift)
Civil Resistance

- Vote
- Talk about the climate crisis (urgency and agency)
- Contagion of low-carbon lifestyle (social norm shift)
Civil Resistance

• Method to change the status quo using a diverse set of nonviolent, noninstitutional actions (strikes, protests, occupations, boycotts, etc.)
Fridays for Future

Scientists for Future
We’re occupying schools across the world to protest climate inaction

Youth activists involved in End Fossil: Occupy!

We can’t keep sitting in school, pretending everything is all right, and studying as if the planet wasn’t on fire.
Extinction Rebellion
Extinction Rebellion

WHY WE ARE HERE?

OUR DEMANDS.

1. TELL THE TRUTH.
Governments must tell the truth by declaring a climate and ecological emergency, working with other institutions to communicate the urgency for change.

2. ACT NOW.
Governments must act now to halt biodiversity loss and reduce greenhouse gas emissions to net zero by 2025.

3. GO BEYOND POLITICS.
Governments must create and be led by the decisions of a Citizens’ Assembly on climate and ecological justice.

84 COUNTRIES
1185 GROUPS
151 UPCOMING EVENTS

A GLOBAL MOVEMENT.

Join our global and politically non-partisan movement where we use non-violent direct action to persuade governments to act justly on the climate and ecological emergency.
Civil Disobedience Climate Movements

- Fridays for Future
- Extinction Rebellion
- Sunrise Movement
- Indigenous peoples
- Letzte Generation
- Ende Gelände
- Insulate Britain
- Just Stop Oil
- Debt for Climate
- Declare Emergency
- Blockade Australia
- Save Old Growth
- Scientist Rebellion
- ...
Scientist Rebellion
Scientist Rebellion

- Global movement of scientists and academics, from PhD students to full professors
- Engage in civil disobedience
- Decentralized and horizontal organisation
Over 1000 academics in 26 countries took to the streets during 4 - 9 April

- Blocking government ministries / corporations, paper pastings
- Academic strikes, occupations, teach-ins, street theatre
- Mass arrests in multiple countries
- Global press coverage
Scientist Rebellion at Chase Bank Los Angeles
7.1K views • 3 months ago

Climate Ad Project

When *scientists* around the world are putting their bodies on the line to

Source
Scientist Rebellion takes action in the Netherlands

3.8K views • 3 months ago

Scientist Rebellion

To secure a liveable future, we need emergency action! 🌐 The scientific commu...
“I wish the Ring had never come to me. I wish none of this had happened.”
“So do all who live to see such times, but that is not for them to decide. All we have to decide is what to do with the time that is given to us.”
Thank you!