A record year: 2017

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CO$_2$ emission rising again: record levels

Data: CDIAC/GCP/BP/USGS

2000–09: $+3.3\%$/yr
1990–99: $+1.1\%$/yr

2016: 36.2 Gt CO$_2$

Projection 2017:
36.8 Gt CO$_2$
$\Delta 2.0\% (0.8\%–3.0\%)$
Atmospheric CO$_2$: record concentrations

Source: climate.nasa.gov

NASA 2018
Atmospheric CO₂: the long view

2017 Observed

Luthi et al. 2008
Atmospheric methane concentrations: record

GLOBAL MONTHLY MEAN CH₄

CH₄ mole fraction (ppb)

YEAR

NOAA 2018
Global temperatures keep rising
La Niña keeping it cooler in 2017

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST Anomaly (degrees C), 12/28/2017

(white regions indicate sea-ice)
El Niño made it hotter in 2016
High temperatures almost everywhere

Annual J-D 2017  L-OTI(°C) Anomaly vs 1951-1980  0.90

NASA 2018
Racing towards the Paris 1.5°C ‘aspirational target’

![Graph showing annual global mean surface temperature anomaly (°C) from 2000 to 2032. The graph compares observed (NOAA) data with the International Panel of Experts (IPO) positive and negative (mean and 25-75th percentiles) predictions. The 1.5°C Paris target (1850-1900 baseline) is marked with a dashed line.](image-url)
Arctic sea ice volume continues to decline
Sea ice extent: record lows

Deviation in Sea Ice Extent (x 1 million km²)

ARCTIC

ANTARCTIC

COMBINED

NASA 2018
Sea level: record high

Change in sea level (mm) compared to the 1993-2008 average

Year

NASA 2018
Sea level rise: new understanding

- Total sea level (adjusted)
- Total sea level (unadjusted)
- Greenland ice sheet
- TWS
- Steric sea level
- Antarctic ice sheet
- Glacier
- Terrestrial water
- Glaciers
- Ocean thermal expansion

Year

1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013

25%

5%
Future sea levels: increasingly of concern

Upper estimate of 2.5m global sea level rise by 2100
Natural catastrophes: events

93% of all events worldwide in 2017 were climate-related

Number of relevant natural catastrophes on the rise

Source: Munich Re NatCatSERVICE
2017 was the second-costliest year ever for natural disasters in terms of overall losses ($330B)
BUT the highest in insured losses ($135B)
Record high losses from climate-related disasters
81% of the losses were from meteorological events compared with an average of 41%
The proportion of insured losses was even higher (89%)
The U.S. share of losses was 50% as compared to the long-term average of 32%
In contrast, geophysical events were 3% of losses
Emission reductions to keep within 2°C

Data: SSP Database (IIASA)/GCP

Emissions from fossil fuels and land-use change (GtCO₂/yr)

2017 Estimate

Historical

net-negative global emissions
Australia’s GHG emissions rising again

- Australia’s emissions rose by 0.7% in 2016-2017.
Australia was warm too
Warm almost everywhere

Mean Temperature Deciles
1 January to 31 December 2017
Distribution Based on Gridded Data
Australian Bureau of Meteorology
Australian rainfall: mixed
Perth dam inflows
Climate already putting brakes on agriculture

Hughes et al. 2017
Climate change and business risk

• ‘The top priority for the next few years and decades must be for society and the world to adapt to the now inevitable impact of climate change’
  
  *Munich Re*

• ‘While there is still time to act, the window of opportunity is finite and shrinking’

  *Mark Carney, Governor of Bank of England*

• Climate change ‘risks are foreseeable, material and actionable now … and regulators here and abroad are paying attention’

  *Geoff Summerhayes, APRA*
Canberra was hot and dry in 2017

- 0.9°C above average – 3\textsuperscript{rd} warmest
- Record warmest January and warmest winter but coldest February morning
- 56 days were over 30°C – more than the average of 33 but consistent with recent warming
- More frosty nights (109 vs average of 93)
- But also more nights warmer than 15°C (46 vs average of 29)
- Driest year since 2009
Summary

• Many record-breaking changes in 2017
• More change is in store
• Neither emission-reduction responses (except in a few jurisdictions like the ACT) nor adaptation responses are keeping pace
• Positive, strategic and timely climate-smart choices in a fast-changing world