

A summary timeline of important events

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300 million years ago

Hot, humid, lots of carbon dioxide; no humans

Ferns, mosses, algae all very happy and growing and sequestering carbon; they fossilise and turn into oil, coal and natural gas – our fossil fuels!

Little sea creatures (molluscs, plankton) convert carbon dioxide (CO₂) to calcium carbonate (CaCO₃) for their shells; these fossilise into limestone which we use to make cement

10 000 years ago

Agriculture begins in the Middle East (humans start affecting the age-old carbon cycle)

1500-1900 Europe and North America's forests cut down to build ships, plant crops, etc.

1769 Watt invents the coal-fired steam engine; the industrial revolution begins; atmospheric CO₂ is 280ppm (parts per million)

1827 Fourier calculates that earth's temperature should be an icy minus 16°C (which it is not!)

1863 Tyndall discovers CO₂ and water vapour are transparent to light and opaque to heat

1890s Arrhenius figures out that Fourier was wrong because CO₂ and water vapour act as greenhouse gases; he alerted us to problem of fossil fuel burning – but said not to worry because it would take 3000 years before CO₂ concentration doubles, and in any event it wouldn't be a bad thing to be a bit warmer (he lived in Sweden).

Aside: Arrhenius's time frame was out by a long way: at current rates, we will double CO₂ concentration by 2100; and there are real reasons to worry about a warmer planet

1920s Richardson (a WW1 ambulance driver) developed a set of equations to model weather; he needed a big hall with 64,000 people wielding slide-rulers to measure weather as fast as it was happening

1957 Keeling measures CO₂ at Mauna Loa, Hawaii – it is rising and has seasonal fluctuations

1970s-1980s Sustainable development and climate change enter the international and United Nations agenda: UN Conference on the Human Environment (Stockholm, 1972), Brundtland Report on Sustainable Development, first world climate conference (1979), etc.

1987 IPCC (Intergovernmental Panel on Climate Change) established; warning about global warming and climate change start surfacing and entering the political discourse

1989 Berlin wall falls; growing smugness (and power) of capitalists. Rapid collapse "dirty" USSR economies give the appearance of massive carbon reductions

1990 IPCC first assessment report published; baseline for developed country emission reductions

1992 Rio Earth Summit, UNFCCC (UN Framework Convention on Climate Change) signed by 154 nations; aim to stabilise greenhouse gas concentrations; no binding emission targets; recognises common but differentiated responsibilities; Annex 1 lists countries that must act first on emission reductions; establishes COP (Conference of Parties)

George Bush senior says: "American lifestyles are not negotiable"

1994 Alliance of Small Island States demand 20% cut in emissions by 2005 (to cap sea level rise at 20cm)

1995 Hottest year on record

- 1997 Kyoto Protocol establishes legally binding emissions cuts of average 5.4% emissions cuts by 2012; needs ratification of countries representing 55% of emissions to become law; flex mex (flexible mechanisms), aka carbon trading; carbon sinks; 1990 baseline, CO₂ equivalent
- 1998 Hottest year in the hottest decade in the hottest century of the millennium (that's hot!)
- 1999 Mann publishes the famous/infamous hockey stick curve (that's ice-hockey, not field hockey)
- 2001 *Skeptical environmentalist* by Bjørn Lomberg published
- 2002 Second hottest year on record; EU, Japan and others ratify Kyoto; US, Australia, Russia don't – still not in effect
- 2003 Third hottest year on record, 30 000 people die of heat wave in Europe
- 2004 Russia signs Kyoto Protocol – it comes into force in 2005
- 2006 Stern report calculates the cost of climate change; mitigation is cheaper than adaptation and impact; climate change is biggest market failure
- 2005 – Co₂ reaches 379ppm (35% incr since Industrial Revolution)
- 2007 IPCC Fourth Assessment Report, "warming of the climate system is unequivocal as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level"
- 2007 Canada, which had committed to reduce emissions by 6% since 1990, had *increased* emissions by 26% (can no one enforce international law?)
- 2007 COP13, Bali – agrees on 'Bali Road Map' for way forward; introduces need to agree on "Long-term Cooperative Action" (LCA); all to be decided 2 years later in Copenhagen. USA continues to hold back from signing unless commitments are forthcoming from developing countries (a mantra repeated *ad nauseum*)
- 2009 COP15, Copenhagen – no agreement reached on anything; nothing on finance, mitigation targets, legal instruments, etc.; small number of countries present the Copenhagen Accord which confuses all and infuriates some. Emergence of the BASIC bloc
- 2011 South Africa hosts COP18 in Durban. No one has high hopes of a political breakthrough, so no one is disappointed when very little positive progress is made. The Kyoto Protocol is put on life-support and most of the Bali commitments end up in the bin.
- 2012 Rio de Janeiro hosts the "Rio+20" Summit on Sustainable Development. "Green economy" is the fashionable thing, but world-weary environmentalist despair at the lack of political and business will to make any fundamental changes.

NOW

It is now on average 0.74 deg C hotter than it was 100 years ago

Since the 1950s (when data collection began), habitat has moved towards the poles at a rate of 6km per decade, and up the mountains at 5 meters per decade

Between 2000 and 2005, we poured 26.4 gigatonnes (gT) of CO₂ into the atmosphere *every year*, which is the equivalent weight of 4.5 billion African male elephants

Between 2000 and 2010 we had emitted nearly one-third of allowable emissions this century to keep warming below 2°C (330 out of 1000 gT) and more than half of the 350ppm budget (330 out of 750gT)