

The evolution of climate change science, ExxonMobil and its emissions

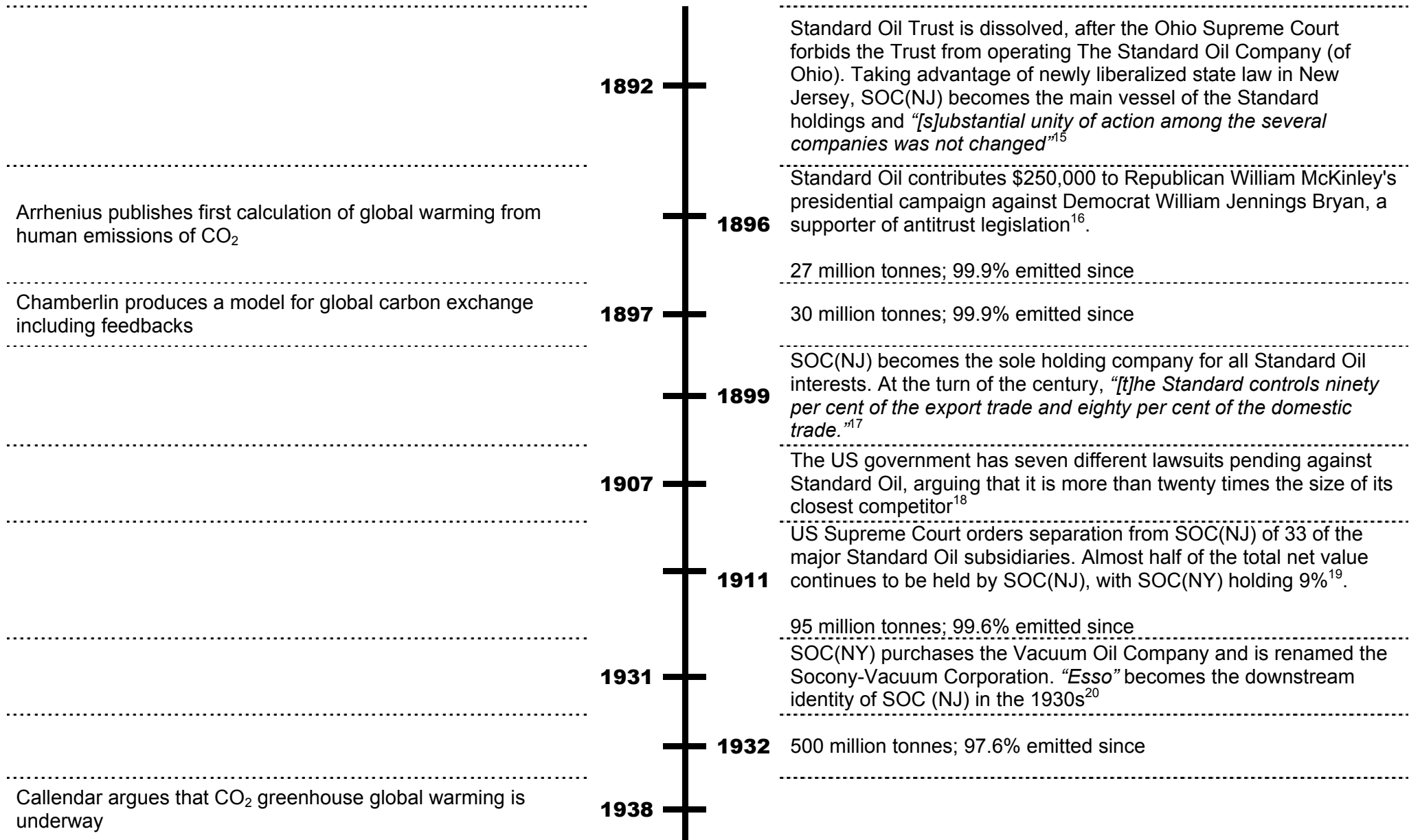
A table showing some of the main developments in the chronology of climate change science, alongside major events in the corporate history of ExxonMobil and the company's cumulative emissions from 1882-2002

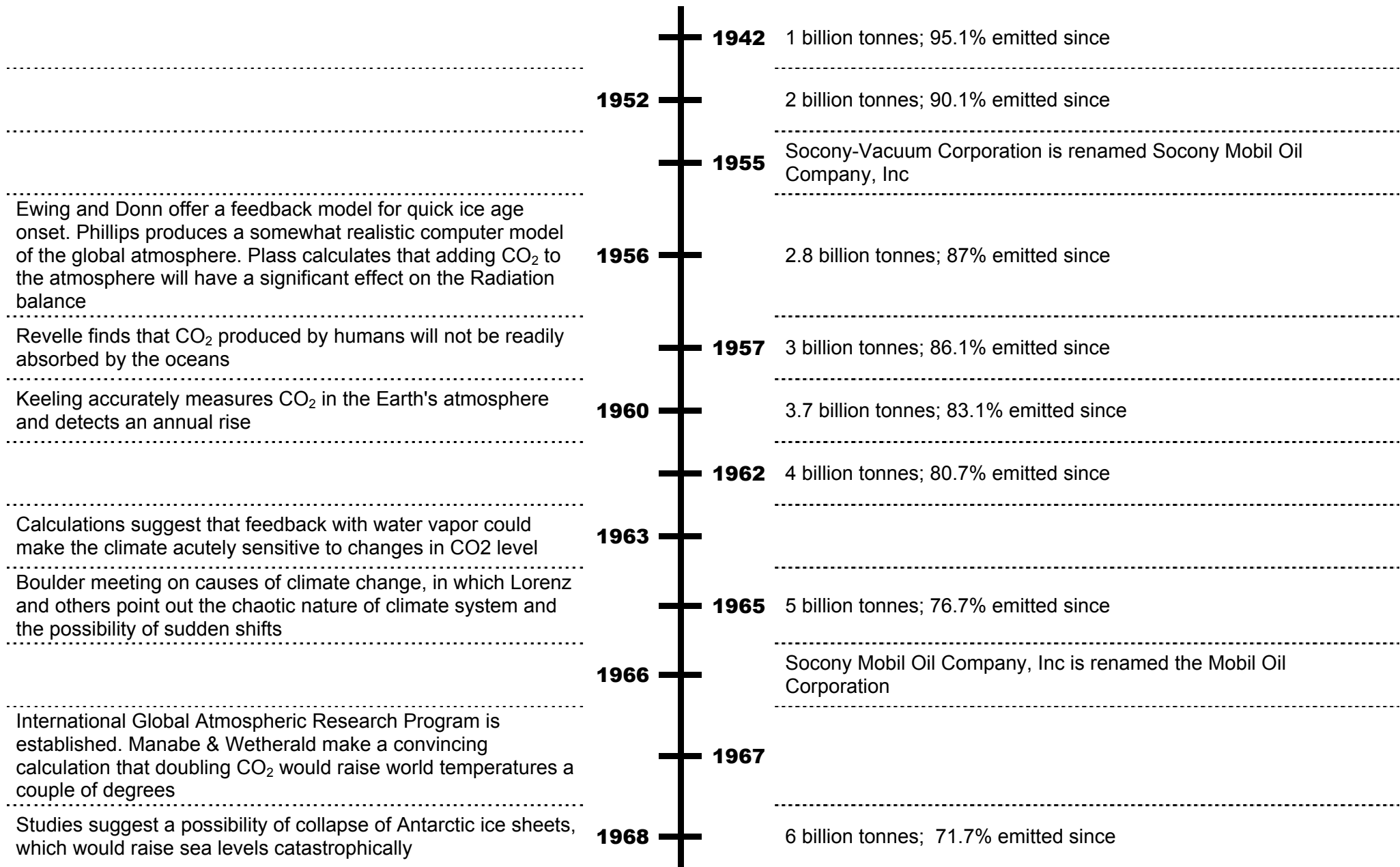
January 2004



The science evolves ¹ ...	Year	ExxonMobil evolves ² ... and the emissions pile up ³
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Benjamin Franklin, described by NASA as a 'climate giant', begins his climate studies ⁴	1763	
Fourier first describes the greenhouse effect ⁵	1824	
	1839	John D. Rockefeller is born ⁶
Tyndall argues that water vapour and carbon dioxide are important for absorbing radiation and hence controlling climate ⁷	1861-63	US Civil War begins (1861). Rockefeller gets involved in the oil business, along with partners Maurice Clark and Samuel Andrews (1863) ⁸
	1865	Rockefeller buys out his partners and founds Rockefeller & Andrews, Cleveland's largest refinery
	1870	The Standard Oil Company is established " <i>for manufacturing petroleum and dealing in petroleum, and its products</i> " ⁹ in Cleveland, Ohio, with 4% of the refining business ¹⁰ , becoming " <i>the largest concern in the oil region</i> " in 1872 ¹¹ , " <i>controll[ing] ninety-five per cent of the refineries in the oil region</i> " in 1879 ¹² , and making Rockefeller one of the twenty richest men in the US ¹³
	1882	Standard Oil Trust is established, along with the Standard Oil Company of New Jersey (SOC(NJ)), later Exxon, the Standard Oil Company of New York (SOC(NY)), later Mobil, amongst 30 regional companies of the Trust – " <i>[o]ver every branch of the industry, in 1883, it was supreme</i> " ¹⁴
	1888	First foreign affiliate, London-based Anglo-American Oil Company Limited is established





Budyko & Sellers present models of catastrophic ice-albedo feedbacks. Nimbus III satellite begins to provide comprehensive global atmospheric temperature measurements

Creation of U.S. National Oceanic and Atmospheric Administration, the world's leading funder of climate research. Aerosols from human activity are shown to be increasing swiftly. Bryson claims they are causing global cooling

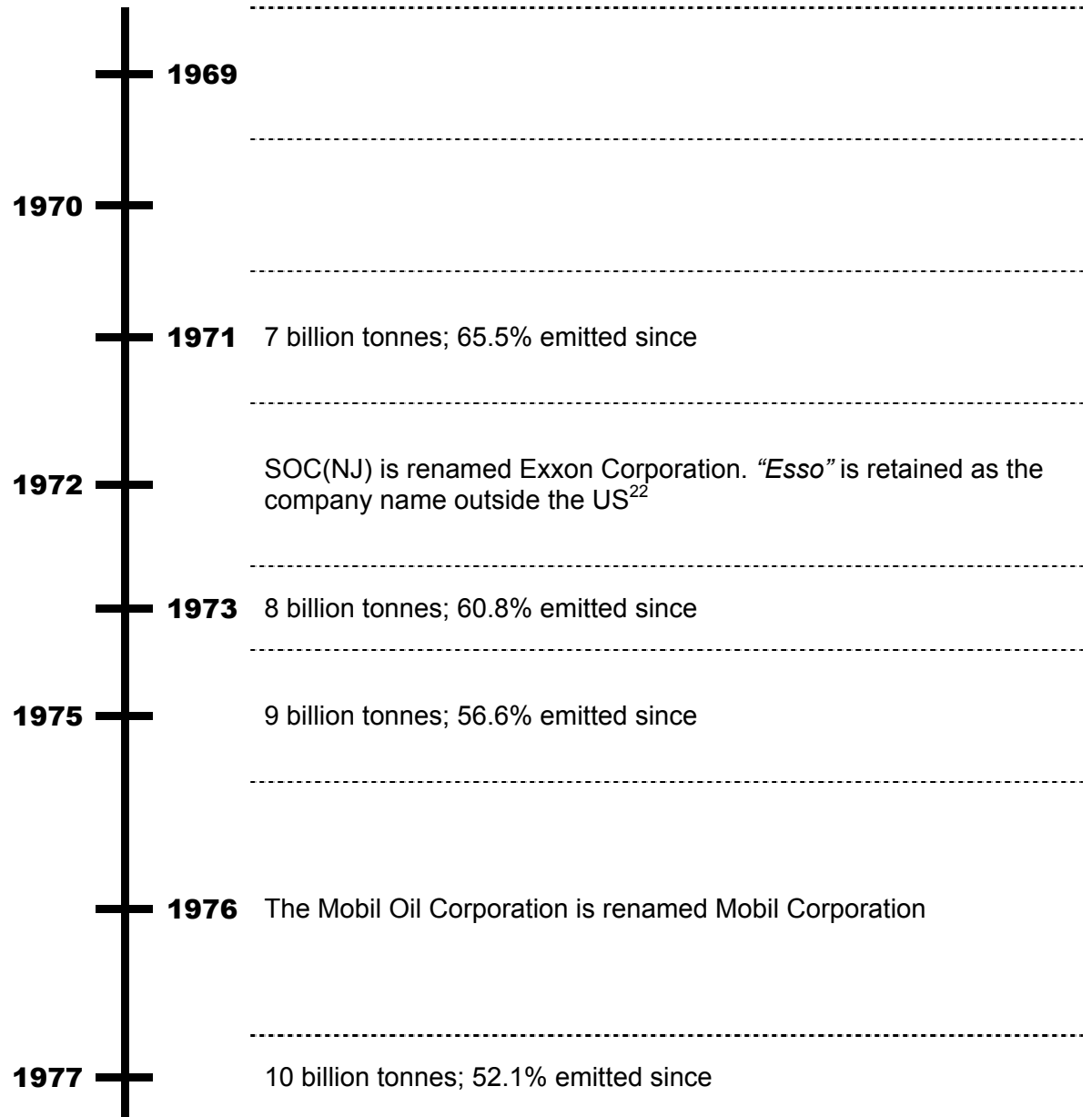
Study of Man's Impact on Climate (SMIC) conference of leading scientists reports a danger of rapid and serious global change caused by humans, calls for an organized research effort

The first United Nations Conference on the Human Environment identifies climate change as a pressing issue.²¹ Ice cores and other evidence show big climate shifts in the past between relatively stable modes in the space of a thousand years or so, especially around 11,000 years ago

Manabe and collaborators produce complex but plausible computer models which show a temperature rise of several degrees for doubled CO₂. WMO holds International Symposium on Long-Term Climate Fluctuations²³

Studies show that CFCs (1975) and methane and ozone (1976) can make a serious contribution to the greenhouse effect. Deep-sea cores show a dominating influence from 100,000-year Milankovitch orbital changes, emphasizing the role of feedbacks. Deforestation and other ecosystem changes are recognized as major factors in the future of the climate. Eddy shows that there were prolonged periods without sunspots in past centuries, corresponding to cold periods

Scientific opinion, conveyed to the public by journalists, tends to converge on rapid global warming as the biggest climate risk



Attempts to coordinate climate research in U.S. end with an inadequate National Climate Program Act, accompanied by rapid but temporary growth in funding

The first World Climate Conference is held in Geneva²⁴, and the World Climate Research Programme is launched to coordinate international research. US National Academy of Sciences report finds it highly credible that doubling CO₂ will bring 1.5-4.5°C global warming

The first WMO/UNEP/ICSU meeting on CO₂-induced climate change is held in Villach²⁵

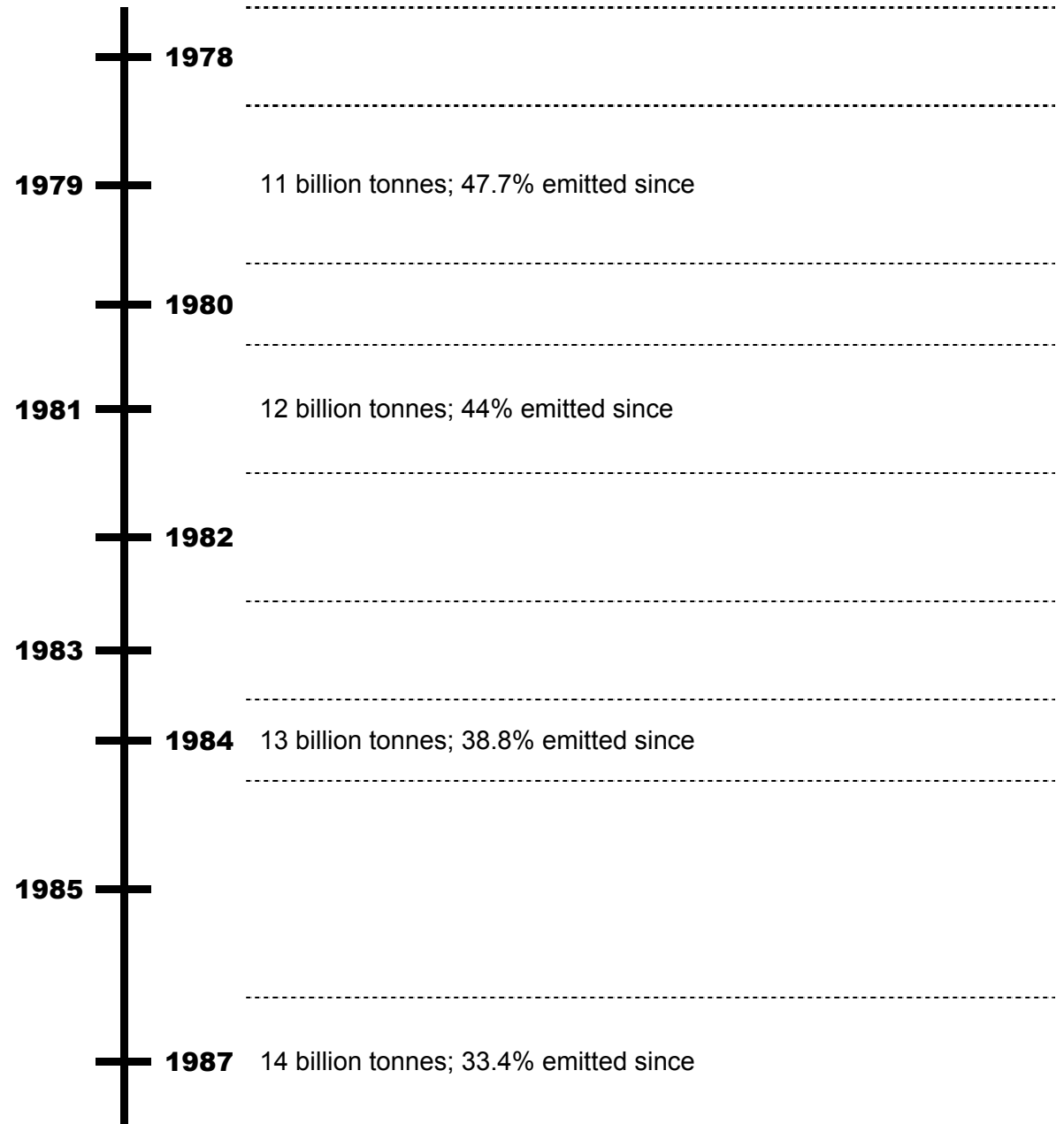
Hansen and others show that sulfate aerosols can significantly cool the climate, raising confidence in models showing future greenhouse warming. Some scientists predict greenhouse warming “signal” should be visible by about the year 2000

Greenland ice cores reveal drastic temperature oscillations in the space of a century in the distant past. Strong global warming since mid-1970s is reported, with 1981 the warmest year on record

Reports from U.S. National Academy of Sciences and Environmental Protection Agency spark conflict; greenhouse warming becomes prominent in mainstream politics

Villach conference declares consensus among experts that some global warming seems inevitable, calls on governments to consider international agreements to restrict emissions. Antarctic ice cores show that CO₂ and temperature went up and down together through past ice ages. Broecker speculates that a reorganization of North Atlantic Ocean circulation can bring swift and radical climate change

Montreal Protocol of the Vienna Convention imposes international restrictions on emission of ozone-destroying gases. Antarctic ice cores show that CO₂ and temperature went up and down together through past ice ages



Intergovernmental Panel on Climate Change (IPCC) is established. News media coverage of global warming leaps upward following record heat and droughts plus testimony by Hansen. Toronto conference calls for strict, specific limits on greenhouse gas emissions: 20% reduction of global CO₂ emissions by 2005²⁶. Ice-core and biology studies confirm living ecosystems make climate feedback by way of methane, which could accelerate global warming

The summit on Protecting the Atmosphere is held in the Hague. The Noordwijk Declaration on Atmospheric Pollution and Climate Change advocates a 20% goal for emissions reduction²⁷

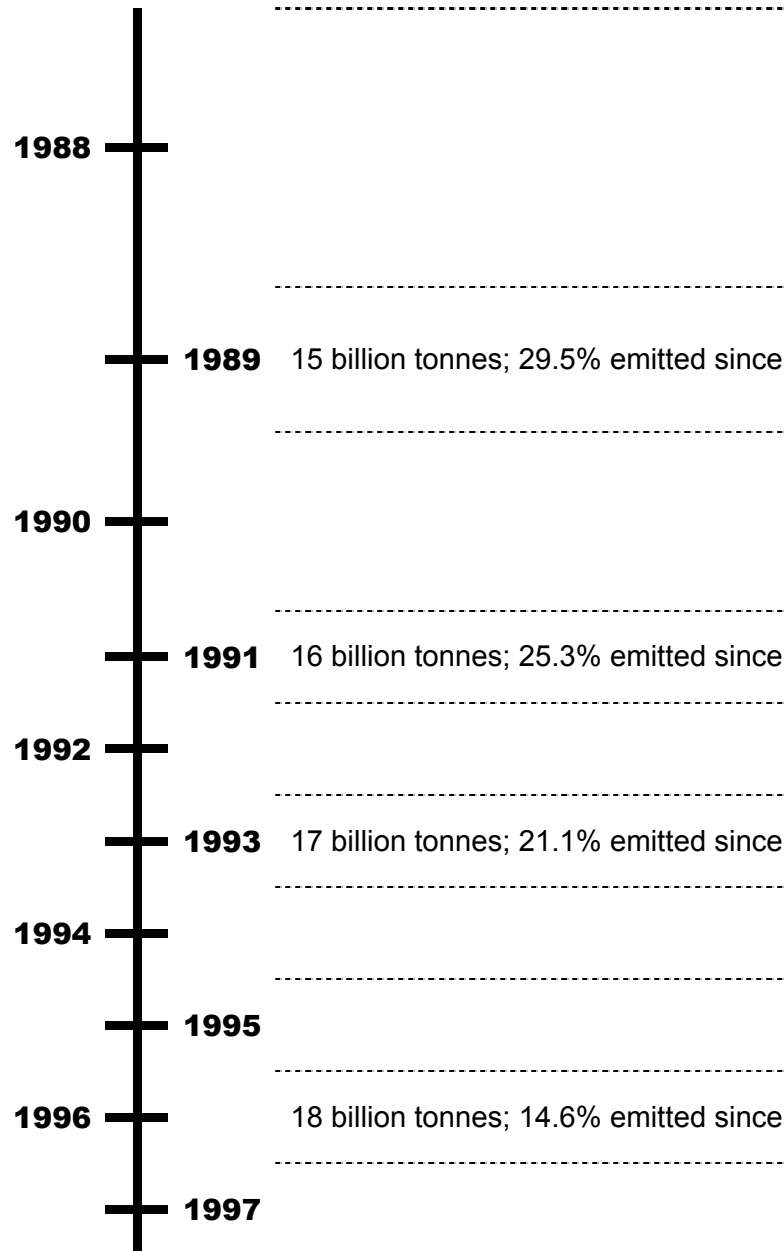
IPCC First Assessment Report is published, finding that the IPCC is "*certain [that] emissions resulting from human activities are substantially increasing atmospheric concentrations of greenhouse gases*". The Second World Climate Conference is held in Geneva

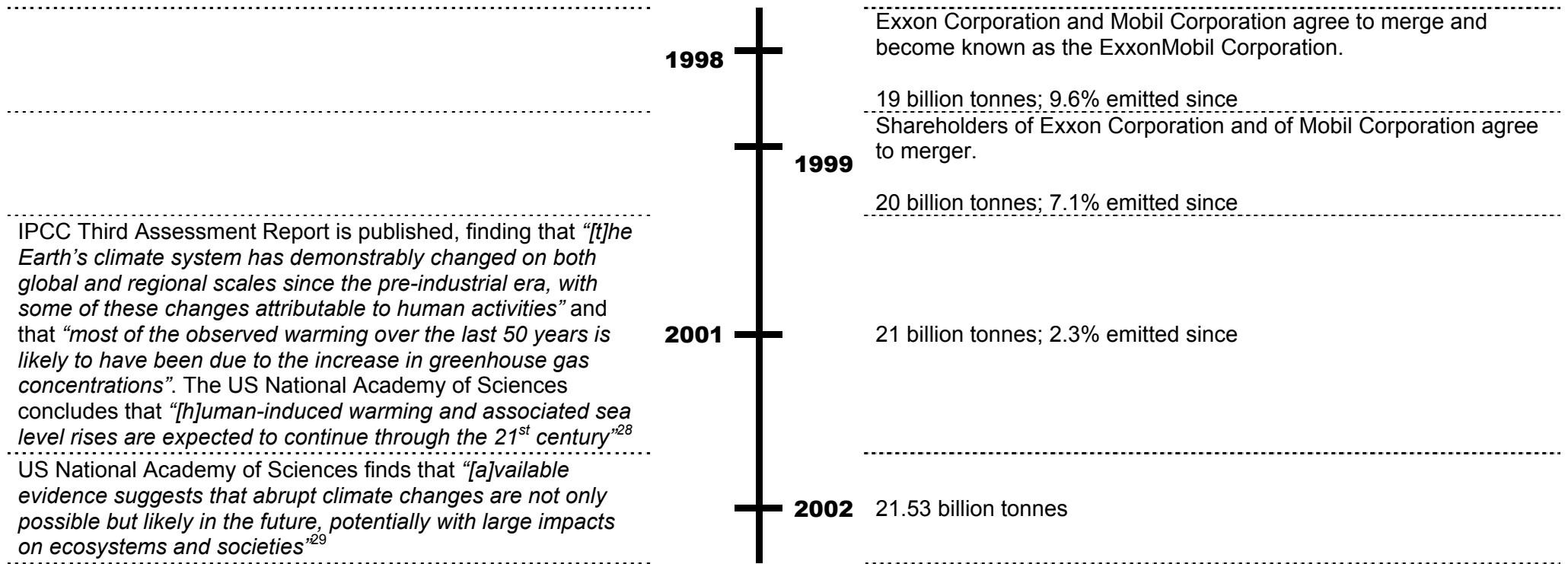
United Nations Framework Convention on Climate Change (UNFCCC) is signed at Rio de Janeiro

UNFCCC enters into force

IPCC Second Assessment report is published, finding "*a discernible human influence on global climate*"

Kyoto Protocol is signed, adopting legally binding greenhouse gas reduction targets





¹ Unless specifically stated, all information in this column through to 1988 is taken from the American Institute of Physics’ *Discovery of Global Warming: Timeline of Milestones*. See <http://www.aip.org/history/climate/timeline.htm>

² Unless specifically stated, all information on corporate history in this column is taken from *The International Directory of Company Histories* (Jay P. Pederson, ed., 2000), volume 32, or *The International Directory of Company Histories* (Tina Grant & Jay P. Pederson, eds., 1998), volume 21.

³ Figures of million and billion tonnes in this column represent the cumulative carbon equivalent amount of Exxon Mobil emissions of carbon dioxide and methane since 1882 reached in the relevant year, alongside the percentage of those emissions, rounded to one decimal point, made since that year through to 2002, as provided in *ExxonMobil Corporation Emissions Inventory 1882-2002, Methods & Results, plus associated spreadsheets* (Heede, Climate Mitigation Services, 2003).

⁴ NASA’s Earth Observatory. See http://earthobservatory.nasa.gov/Library/Giants/Franklin/franklin_2.html

⁵ John F. Kennedy School of Government, reprinted from the book *Learning to Manage Global Environmental Risks-Volume 1: A comparative History of Social Responses to Climate Change, Ozone Depletion and Acid Rain*, by The Social Learning Group (MIT Press, 2001) (“JFK School of Government”). See http://www.ksg.harvard.edu/sl/docs/SL_Apdx2B.3_CCChronology.pdf

⁶ PBS, the US Public Broadcasting Service. See <http://www.pbs.org/wgbh/amex/rockefellers/timeline/index.html>

⁷ JFK School of Government, see note 5.

⁸ PBS, the US Public Broadcasting Service, see note 6.

⁹ First Act of Incorporation of the Standard Oil Company, 10th January, 1870, published in *The History of the Standard Oil Company*, by Ida M. Tarbell (New York: McClure, Phillips & Co., 1904) Vol. 1, Appendix 2.

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- ¹⁰ *The Rise and Progress of the Standard Oil Company*, by Gilbert Holland Montague (New York-Hong Kong: Books for Business, 1903, 2001 reprint), page 8 (“Montague”). (cf. PBS, the US Public Broadcasting Service (see note 6): “The new company controls 10% of U.S. petroleum refining.”)
- ¹¹ Montague, see note 10, page 32.
- ¹² Montague, see note 10, page 63.
- ¹³ PBS, the US Public Broadcasting Service, see note 6.
- ¹⁴ Montague, see note 10, page 88.
- ¹⁵ Montague, see note 10, page 116.
- ¹⁶ PBS, the US Public Broadcasting Service, see note 6.
- ¹⁷ Montague, see note 10, page 142.
- ¹⁸ PBS, the US Public Broadcasting Service, see note 6.
- ¹⁹ *The Prize: The Epic Quest for Oil, Money and Power*, by Daniel Yergin (New York: Simon & Schuster, 1991), page 110.
- ²⁰ See <http://www.us-highways.com/sohist1941.htm>.
- ²¹ Canadian Government Report. See http://www.climatechange.gc.ca/english/actions/what_are/comprehensive/intro_b.html
- ²² See <http://www.us-highways.com/sohist1999.htm>
- ²³ JFK School of Government, see note 5.
- ²⁴ JFK School of Government, see note 5.
- ²⁵ JFK School of Government, see note 5.
- ²⁶ JFK School of Government, see note 5.
- ²⁷ JFK School of Government, see note 5.
- ²⁸ National Research Council, Committee on the Science of Climate Change, *Climate Change Science: An Analysis of Some Key Questions* (Washington, DC: National Academy Press). See <http://books.nap.edu/html/climatechange>
- ²⁹ National Research Council, Committee on Abrupt Climate Change, *Abrupt Climate Change: Inevitable Surprises* (Washington, DC: National Academy Press). See <http://www.nap.edu/catalog/10136.html>