
The tragedy of the commons

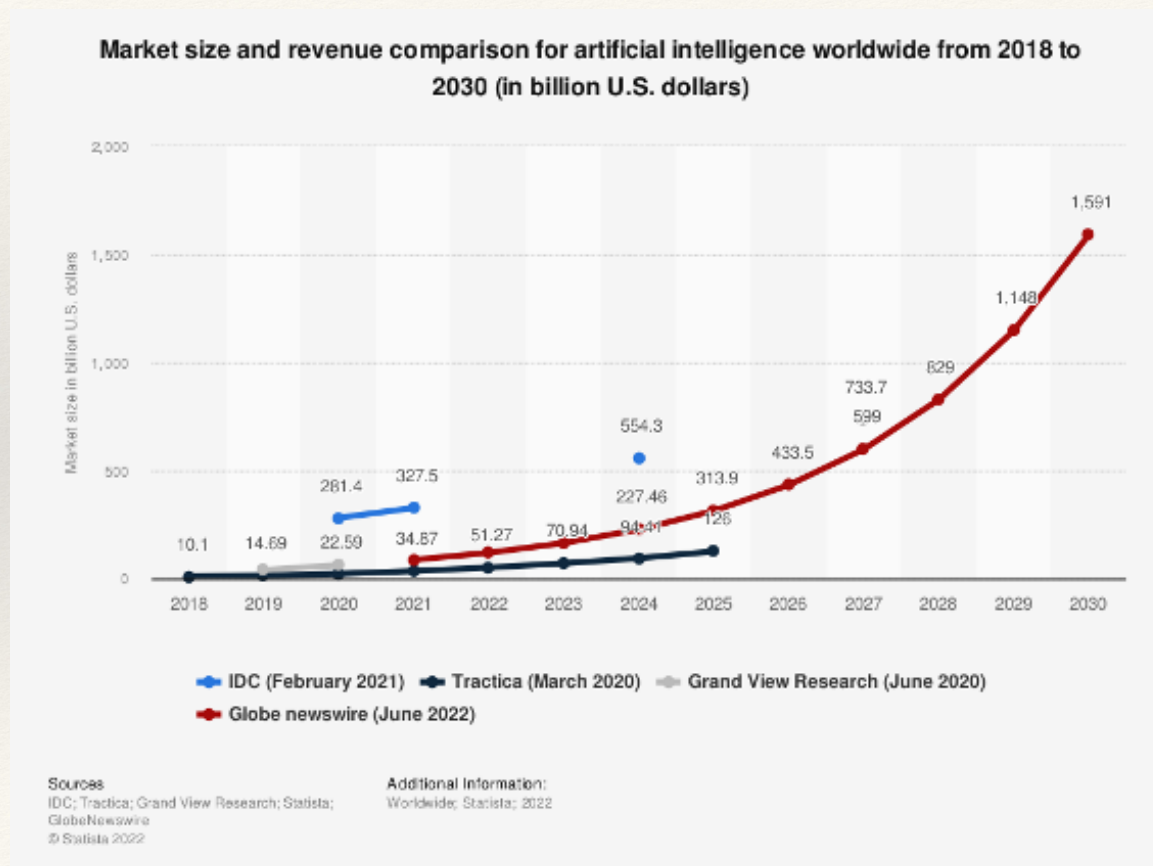
Our moral obligation to nature: <https://www.youtube.com/watch?v=AIRdfWFPiOs>

The corporation: boundary issues: <https://www.youtube.com/watch?v=IDMenqKCXdw>

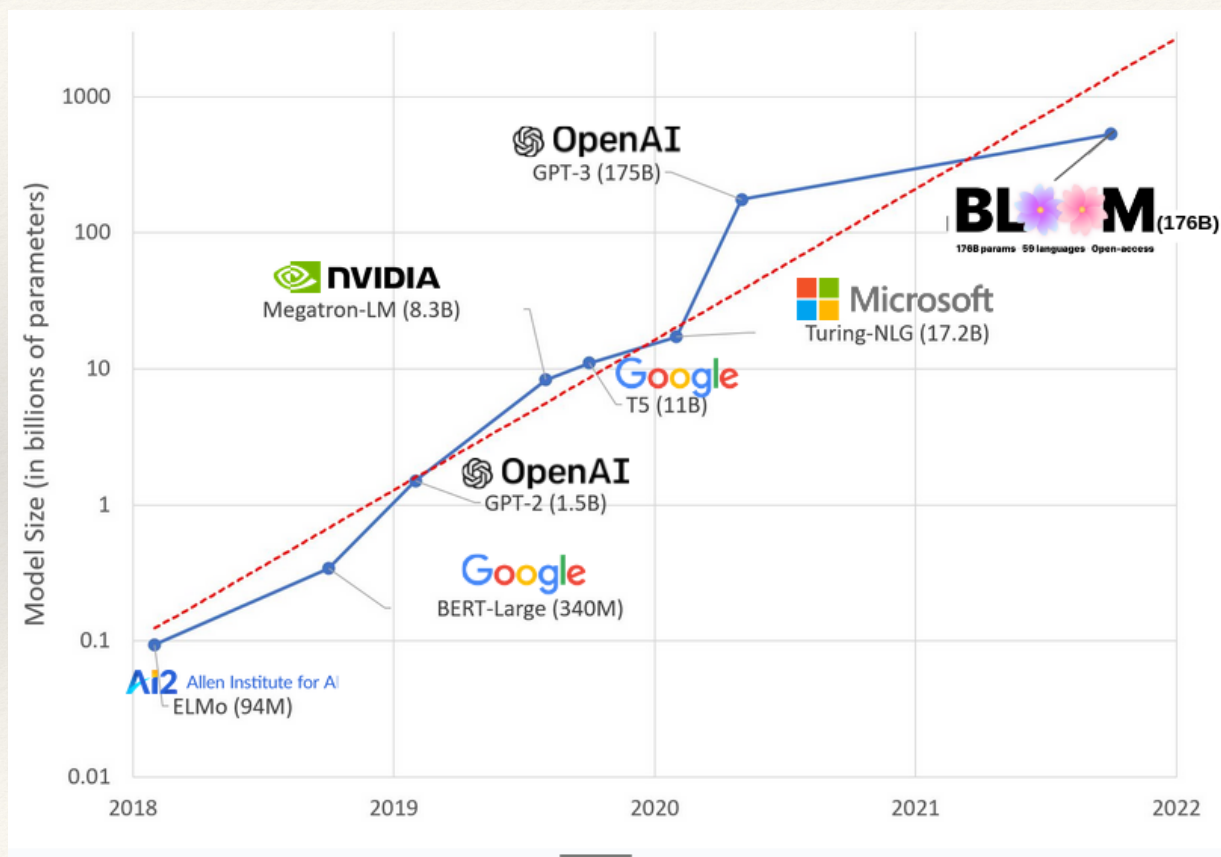
Environmental problems



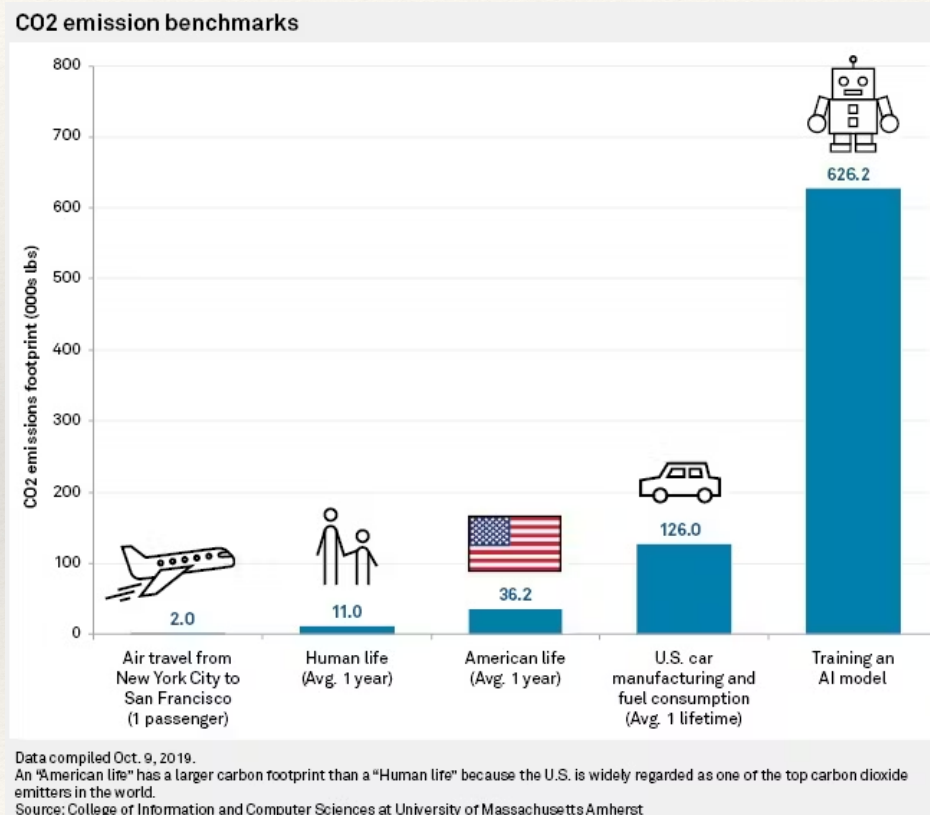
AI and the environment



AI and the environment



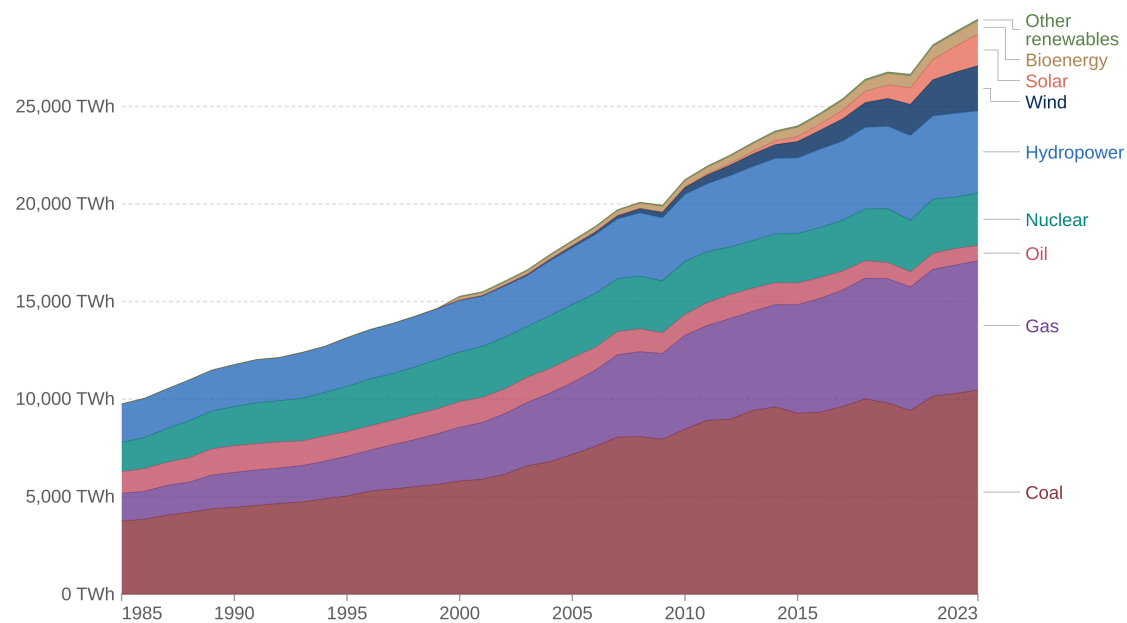
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Electricity production by source, World

Measured in terawatt-hours¹.



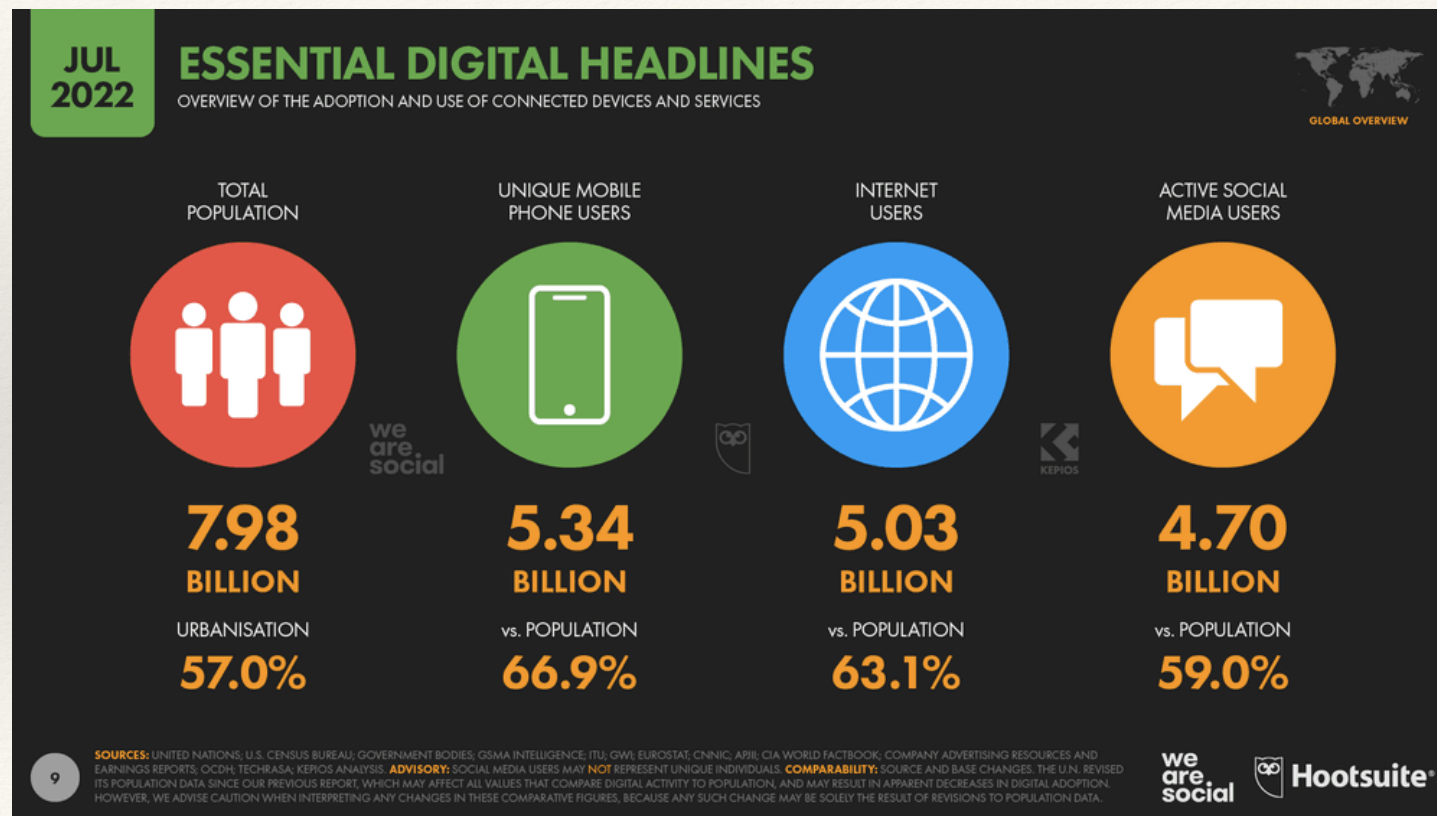
Data source: Ember (2024); Energy Institute - Statistical Review of World Energy (2024)

OurWorldInData.org/energy | CC BY

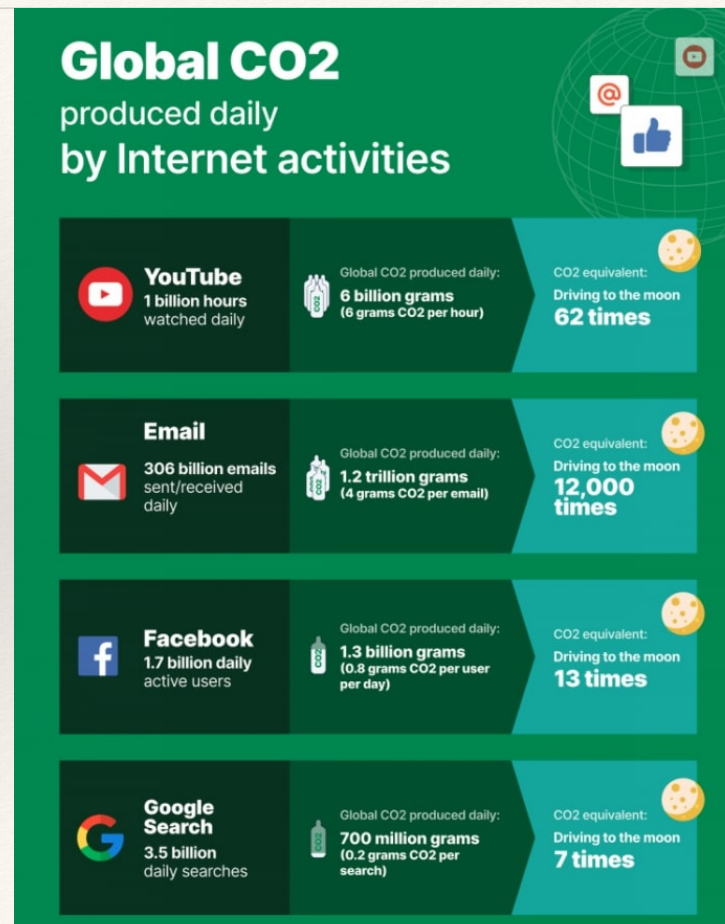
Note: "Other renewables" include waste, geothermal, wave, and tidal.

1. Watt-hour: A watt-hour is the energy delivered by one watt of power for one hour. Since one watt is equivalent to one joule per second, a watt-hour is equivalent to 3600 joules of energy. Metric prefixes are used for multiples of the unit, usually: - kilowatt-hours (kWh), or a thousand watt-hours. - Megawatt-hours (MWh), or a million watt-hours. - Gigawatt-hours (GWh), or a billion watt-hours. - Terawatt-hours (TWh), or a trillion watt-hours.

It is not just AI



It is not just AI



The tragedy of the commons

The Tragedy of the Commons



Use of the commons is below the carrying capacity of the land. All users benefit.



If one or more users increase the use of the commons beyond its carrying capacity, the commons becomes degraded. The cost of the degradation is incurred by all users.



Unless environmental costs are accounted for and addressed in land use practices, eventually the land will be unable to support the activity.

The prisoner's dilemma

The prisoner's dilemma is a game theory thought experiment that describes a situation where two rational individuals have competing incentives that lead them to choose a suboptimal outcome:

- ❖ *The scenario*

Two prisoners are given the choice to confess or not to a crime. The best outcome for both is to stay silent, but the possibility that the other will confess leads them both to incriminate themselves.

- ❖ *The dilemma*

While defecting is rational for each prisoner, cooperation yields a higher payoff for each.

- ❖ *The result*

The rational pursuit of self-interest has put both prisoners in a world of pain.

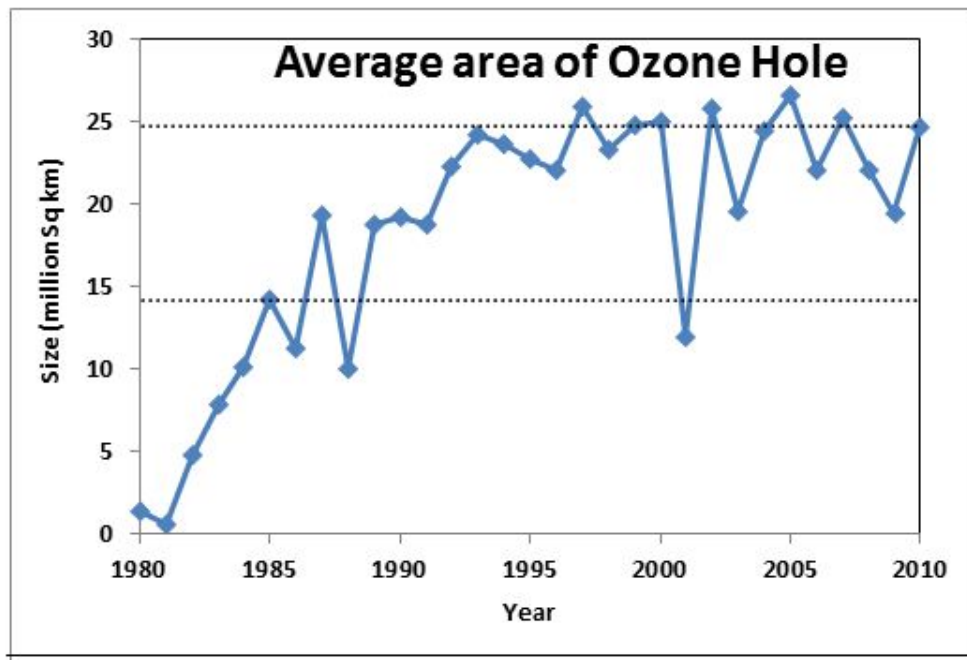
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(PD1) It is *collectively rational* to cooperate and restrict overall pollution: each agent prefers the outcome produced by everyone restricting their individual pollution over the outcome produced by no one doing so.

(PD2) It is *individually rational* not to restrict one's own pollution: when each agent has the power to decide whether or not she will restrict her pollution, each (rationally) prefers not to do so, whatever the others do.

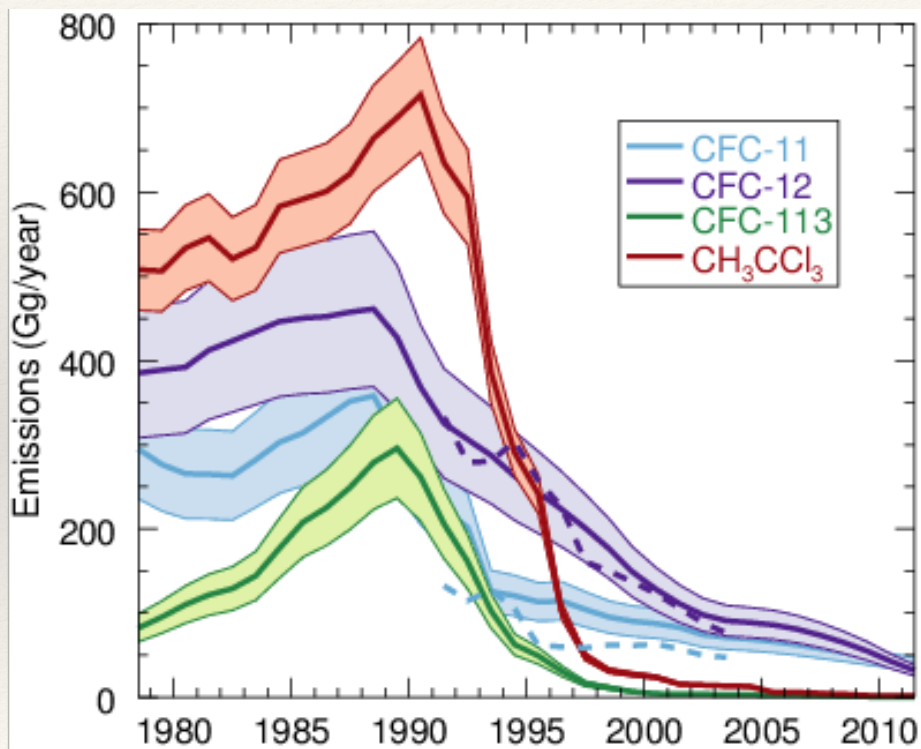
Gardiner, 2011

Some hope? Ozone layer hole



The ozone layer, which lies high in the atmosphere, shields us from harmful ultraviolet (UV) rays that come from the Sun. Human activities effectively punched a hole in it, through the use of gases like chlorofluorocarbons (CFCs) in spray cans and refrigerants, which break down ozone molecules in the upper atmosphere.

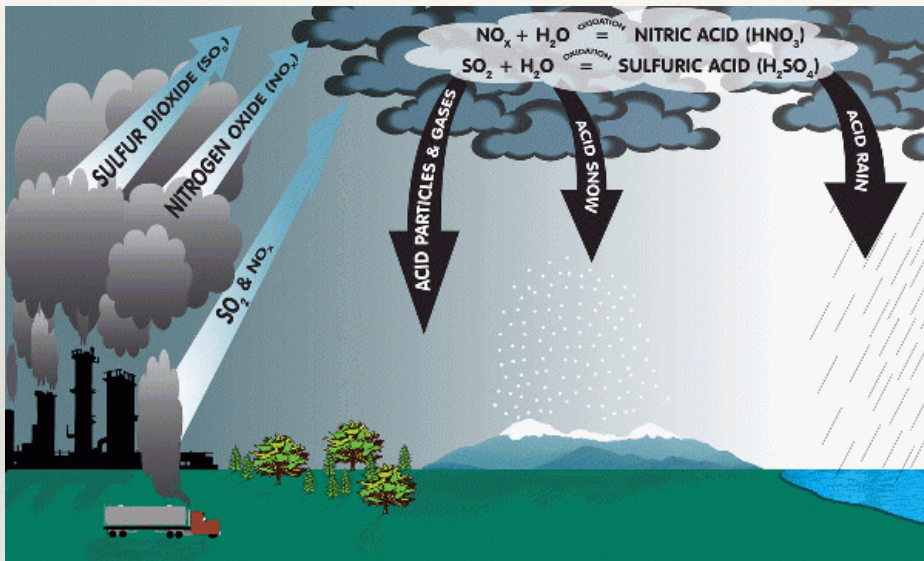
Some hope? Ozone layer hole



In 1987 an historic international agreement was signed (the Montreal Protocol) which came into force in 1989 and set deadlines for reducing and eliminating the production and use of ozone depleting substances. It has since been ratified by 195 countries. Through its various mechanisms, the treaty has brought down worldwide emissions of CFCs and other ozone depleting chemicals sharply. However, due to the long residence time of many of these gases in the atmosphere (for example CFC-12 resides in the atmosphere for approximately 100 years), the ozone layer will not fully recover until around 2050.

Some hope?

Acid rains

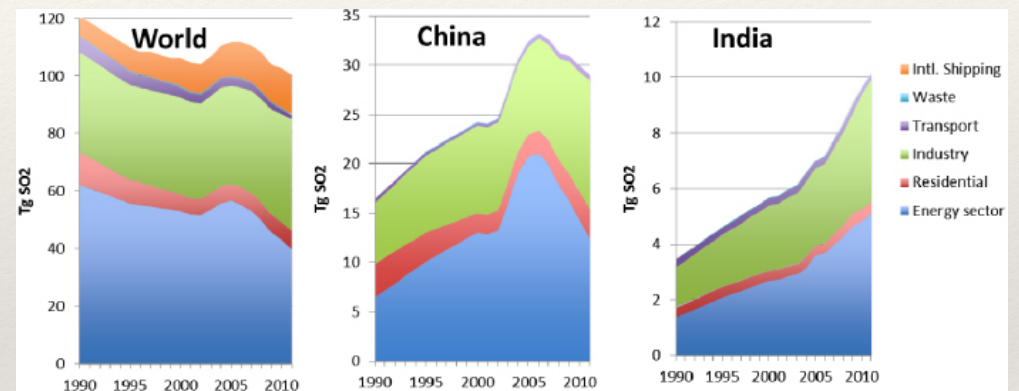
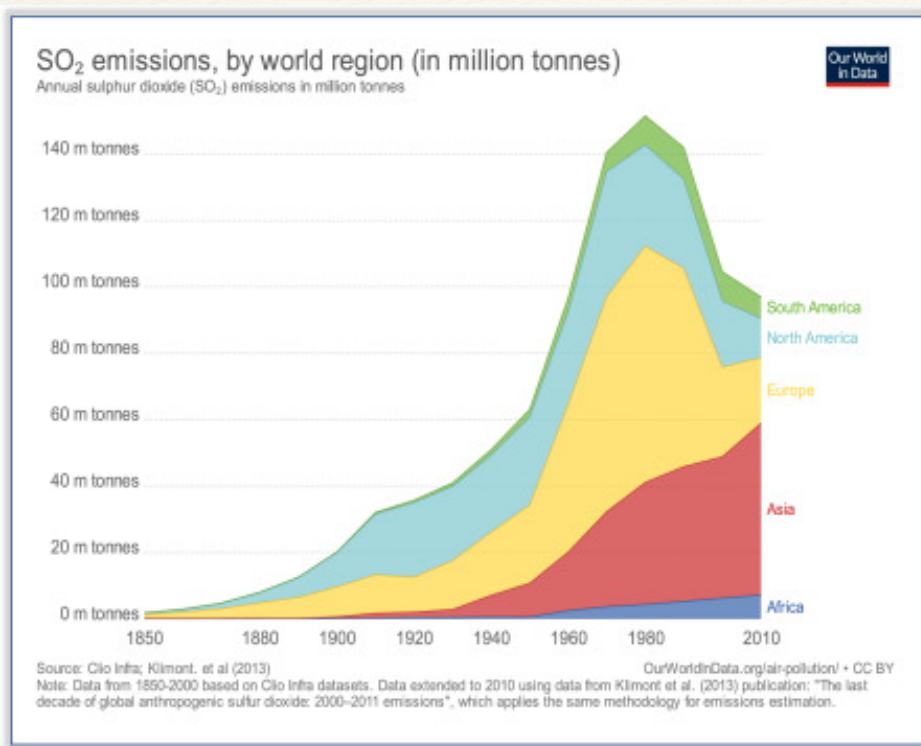


Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic



Some hope?

Acid rains



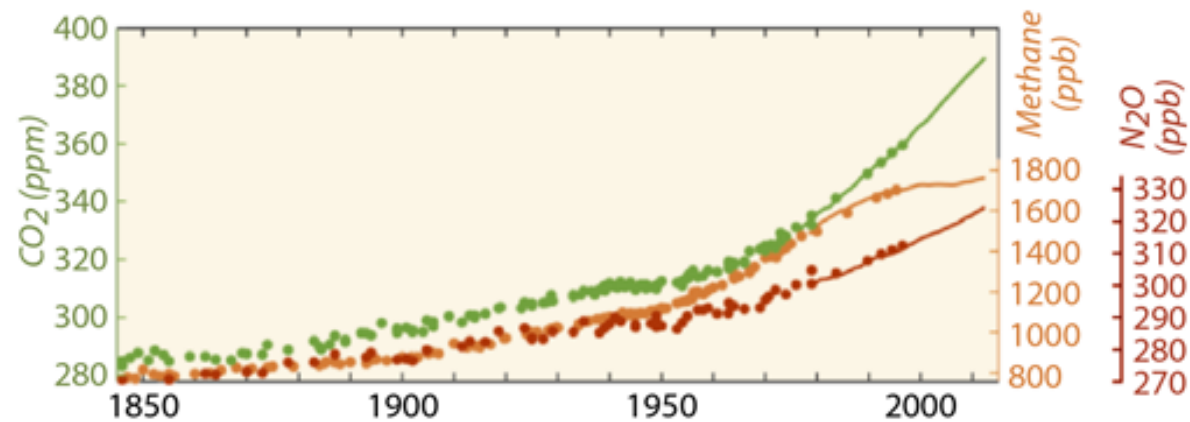
Some hope?
Acid rains

N₂O Emissions Have Been Rising

Like other greenhouse gases, nitrous oxide emissions have been rising since the start of the industrial era. The majority of N₂O emissions come from fertilized soil and animal waste.

GLOBALLY AVERAGED GREENHOUSE GAS CONCENTRATIONS

Parts per million (CO₂) and parts per billion (methane, N₂O)



SOURCE: IPCC AR 5

InsideClimate News