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ENVS 119 - Energy & the Environment

02 - Energy and Climate Change

- Today
- Global Energy Mix.
 - Limits of Fossil Fuels
 - Global Climate Change
 - Reading (McKibben 2006)
 - Quiz #2
 - Wrap-up



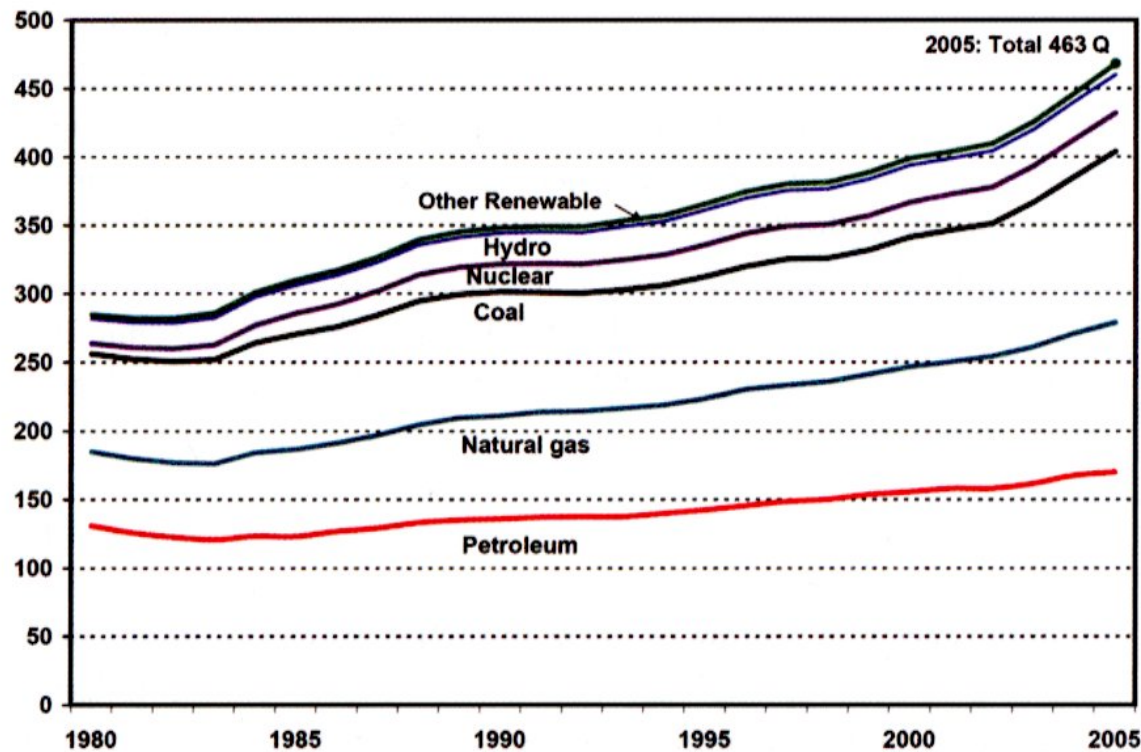
Fossil Fuel Dominance (Gas, Oil, Coal)

1980: World Energy = 90% fossil fuels

2005: World Energy = 86% fossil fuels

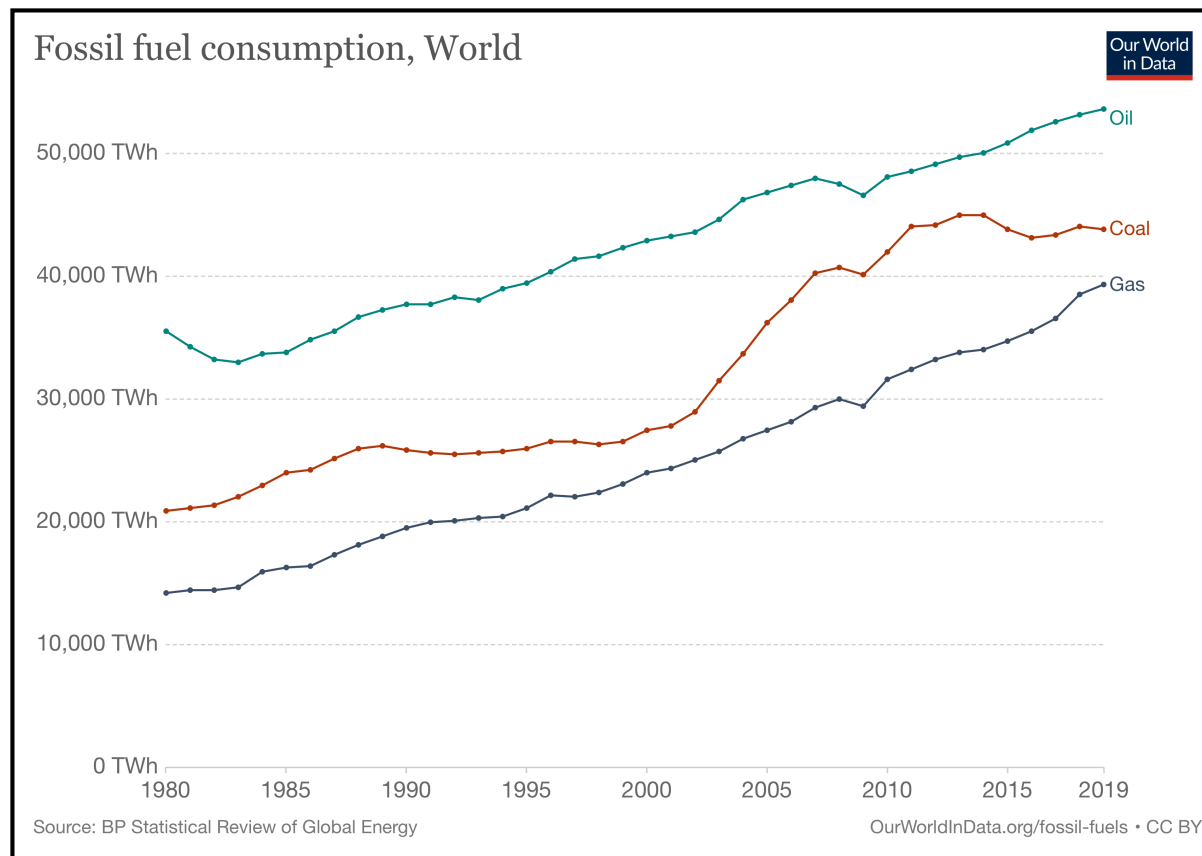
2019?

World Energy Consumption by Source, 1980–2005



Fossil Fuel Dominance (2) + Use Increase

2019: World Energy = 84% fossil fuels (!)



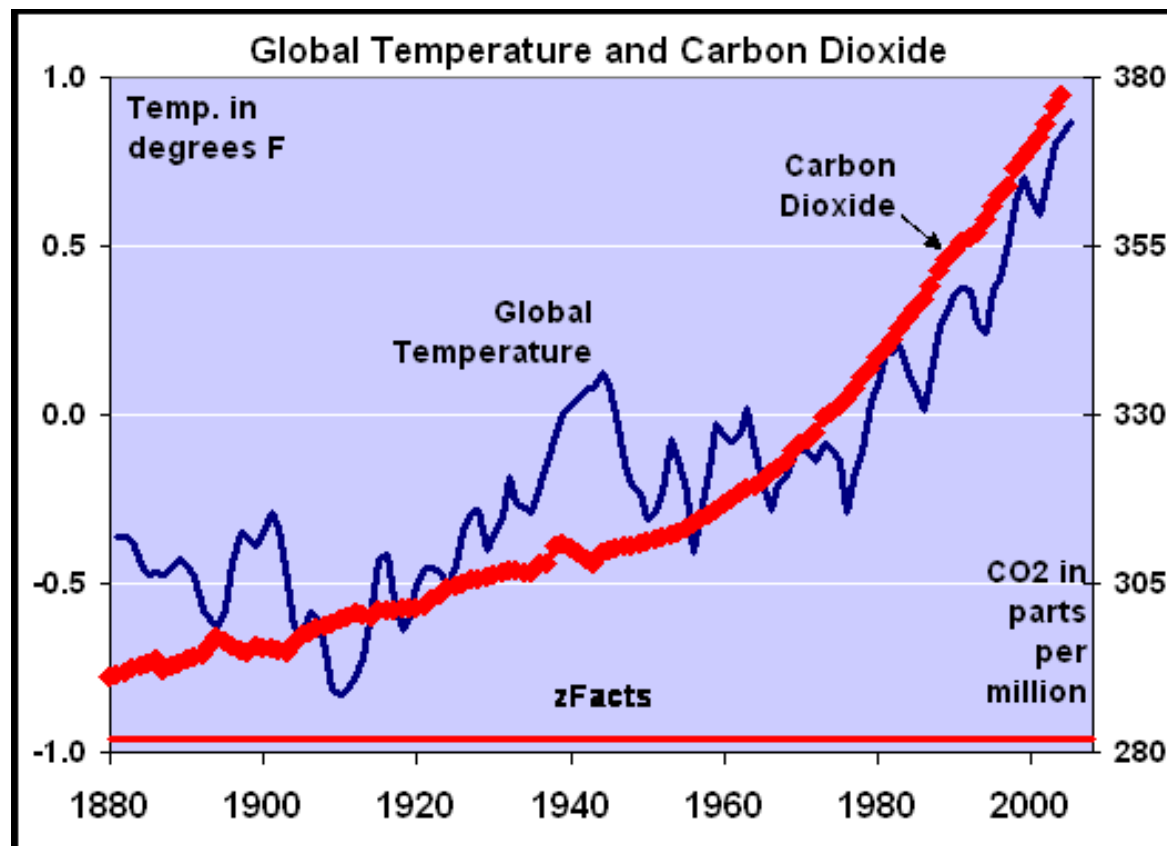
Limits of Fossil fuels (Gas, Oil, Coal)

- All are limited resources (Peak Oil?)
- Creates geo-political tensions (Middle East?)
- Gas, Oil, Coal are burned =
 - Creates CO₂ in the atmosphere
 - Create local air pollutants around power plants, refineries, highways, cities...
PM 10, PM 2.5, NO_x, So_x, VOC
 - Creates discrimination/inequalities in society
(low income neighborhood are more impacted)
 - 10,000 premature death each day from fossil fuel air pollutants*

* 2020 - Jos Lelieveld, Andrea Pozzer, Ulrich Pöschl, Mohammed Fnais, Andy Haines, Thomas Münzel
Cardiovascular Research, <https://doi.org/10.1093/cvr/cvaa025>

Global Climate Change

As the World use fossil fuels, the global temperature increased, with no end in sight.

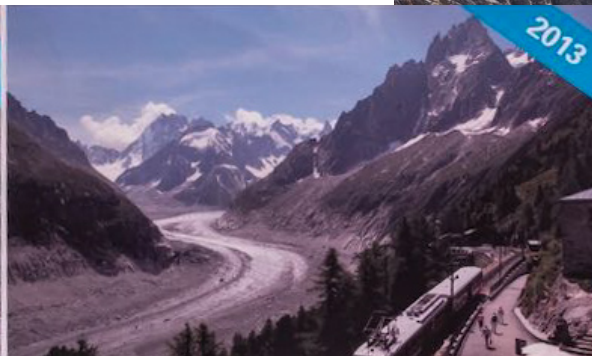


Chamonix, France (2019 v. 1990)



Chamonix, France (1915 v. 2013)

Ice reserves are melting all over the World with a dramatic effect on... Sea level rise!



Reading (McKibben 2012)

- Read now McKibben 2012
Files/readings/02B_mckibben Global Warming's Terrifying New Math
- 10 minutes time
- Take quiz #2
- Back to class
(10 minutes before end of class time)



Smoke rises from the Waldo Canyon wildfire in Colorado Springs, Colorado, 06/27/12. (photo: Reuters)

Global Warming's Terrifying New Math

By Bill McKibben, Rolling Stone

24 July 12

Three simple numbers that add up to global catastrophe - and that make clear who the real enemy is.

If the pictures of those towering wildfires in Colorado haven't convinced you, or the size of your AC bill this summer, here are some hard numbers about climate change: June broke or tied 3,215 high-temperature records across the United States. That followed the warmest May on record for the Northern Hemisphere - the 327th consecutive month in which the temperature of the entire globe exceeded the 20th-century average, the odds of which occurring by simple chance were 3.7×10^{-99} , a number considerably larger than the number of stars in the universe.

Meteorologists reported that this spring was the warmest ever recorded for our nation - in fact, it crushed the old record by so much that it represented the "largest temperature departure from average of any season on record." The same week, Saudi authorities reported that it had rained in Mecca despite a temperature of 109 degrees, the hottest downpour in the planet's history.

Not that our leaders seemed to notice. Last month the world's nations, meeting in Rio for the 20th-anniversary reprise of a massive 1992 environmental summit, accomplished nothing. Unlike George H.W. Bush, who flew in for the first conclave, Barack Obama didn't even attend. It was "a ghost of the glad, confident meeting 20 years ago," the British journalist George Monbiot wrote; no one paid it much attention, footsteps echoing through the halls "once thronged by multitudes." Since I wrote one of the first books for a general audience about global warming way back in 1989, and since I've spent the intervening decades working ineffectively to slow that warming, I can say with some confidence that we're losing the fight, badly and quickly - losing it because, most of all, we remain in denial about the peril that human civilization is in.

McKibben: Global Warming's Math

- **2°Celsius** = Max. temperature elevation “manageable”
- **565 Gigatons** = What humanity can emit before reaching +2° C, by burning fossil fuels (+4 to 5 Gigatons added per year at current rate)
- **2,795 Gigatons** = The carbon emission humanity “could” emit if we end-up burning the currently known fossil fuel reserves.

Conclusion: back to Smil, 2006. The fate of humanity depends on how we will manage the environmental consequences of our energy addiction.

ENVS/ENGR 119 - Lecture 02

End