

Climate Change

Imperial Seminar Presentation

Ivo Welch

May 2023

Intro, Level, Point

- ▶ CC is among the most fascinating subjects of our times, even if it is not *financial* economics.
- ▶ The level is for finance and economics researchers without much background in climate change.
- ▶ I will (try to) convince you that for everything that matters, there should be almost no disagreement.
 - ▶ important vs. unimportant disagreements
- ▶ It advertises a free textbook and hopes one of you will teach such a course.

Warning: Presentation Coverage

- ▶ Covers many areas,
- ▶ Covers work of many other researchers,
- ▶ Covers textbook (my class), and
- ▶ Mentions my own research.

Too much!

- ▶ Many opinions, emotions, and misinformation about CC.
 - ▶ Anyone who reads knows a little about bits and pieces.
 - ▶ Extreme intellectual hostilities, even for academia.
 - ▶ Often information is distorted by ideology and politics, too.
- ▶ I will miss many subtleties in my 75-min attempt.
- ▶ I may have to cut some discussion short. Too much material.
Apologies in Advance. Talk to me over coffee.
- ▶ But I do want to answer (tough) questions. Point of a seminar.
I will tell you if I oversimplified, don't know, or disagree.
- ▶ I am not trying to be brusque.

Talk (and Textbook and Course) Outline

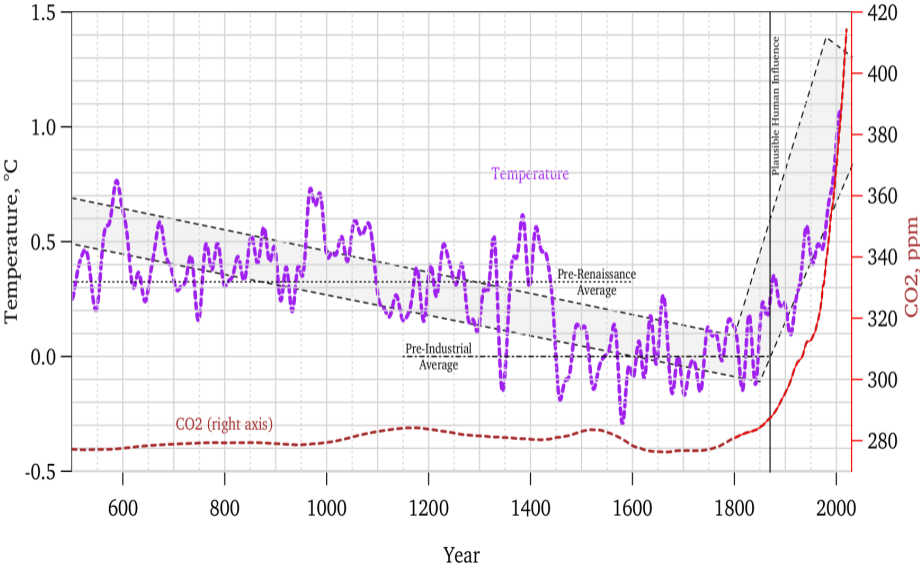
1. Climate Change Earth Science Background
2. Social Science Perspective
3. Technological Situation

1. Climate Change (Earth Science)

- ▶ **Hold policy questions until “2. Social Science.”**
- ▶ **Until 2, science questions only, please.**

- ▶ I use data and predictions from the IPCC.
 - ▶ Reasonably good, despite some (reasonable) quibbles.
 - ▶ Like economics: Not everything is correct and unbiased — but it's way better than the alternatives.
 - ▶ Like economics: In flux. Not knee-jerk but reasonably disciplined.
 - ▶ What would even be reasonable alternatives?
 - ▶ More than good enough for what my own points are.
 - ▶ (Interesting to argue earth science details for other researchers.)
 - ▶ not my main expertise.
 - ▶ if a little better or worse, no problem for what I will suggest.

Strong Evidence

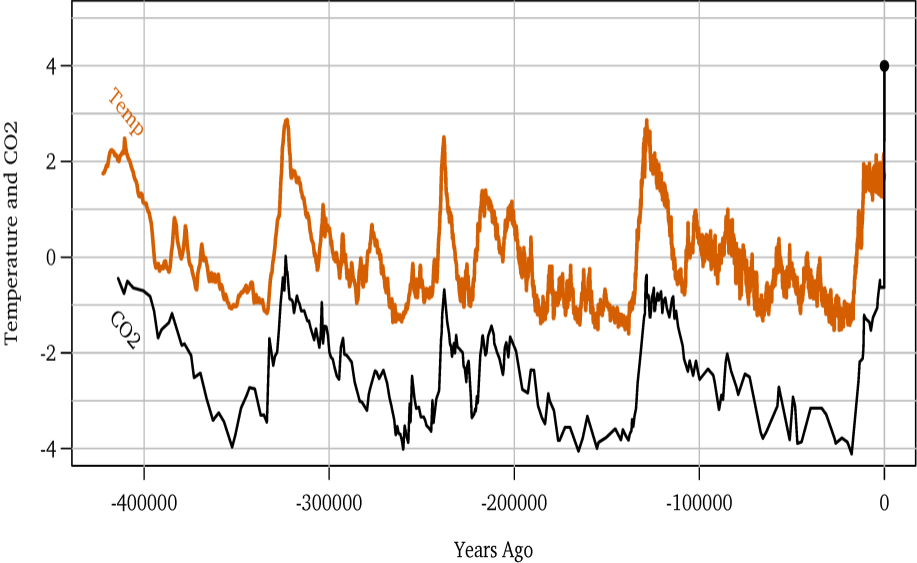


Mechanism

- ▶ Earth has been heating up and will continue to do so.
 - ▶ Measurable current radiation imbalance: In-Out.
 - ▶ Mean consensus: Think $\approx 2-3.5^{\circ}\text{C}$ by 2150 (1°C already).
 - ▶ baseline always difficult to keep straight. I consult book.
 - ▶ 2°C : Boston vs. NY vs. DC vs. Raleigh
 - ▶ 4°C : Munich vs. Milan vs. Palermo
 - ▶ Think Scandinavia, Germany, Italy, Israel
 - ▶ Not uninhabitable, but different
 - ▶ Problems where hot, poor, and populous

- ▶ More catastrophic scenarios, say up to 5°C+, possible.
 - ▶ domino effects, feedback loops, tipping points, unknownsetc.
 - ▶ low prob, but not far-left tail...probably, but not certain.
 - ▶ scientists are not giving a probability distribution.
- ▶ Expected Mean Sea Level (MSL) Rise: \approx 1-2 feet.
 - ▶ could be 6 feet if glaciers melt!
 - ▶ 240 feet since last ice age
 - ▶ fight climate change? 10cm exp diff
 - ▶ The ice age is coming, the sun's zooming in. Meltdown expected, the wheat's growing thin
Engines stop running, but I have no fear 'Cause London is drowning I live by the river

CO2 Now: Smoking Gun?!



Scientific Evidence?

- ▶ Most paleo-evidence is irrelevant.
 - ▶ CO₂ was endogenous, except in some episodes.
 - ▶ hotter temperatures also “bubble out” CO₂.
 - ▶ arguing badly about paleo-evidence, on behalf of a hidden policy agenda, only gives fodder to trolls.
- ▶ Recent 150 years, plus physics, identify current cause:
 - ▶ Humanity is running a ghg experiment — and it is working!
 - ▶ Isotopes strongly suggest fossil fuel drove increase in CO₂.

- ▶ But it doesn't really matter much. If CC had been due to hotter sun, the important questions would be the same:

What should and can we do about CC now?

- ▶ Focus of Book: Mitigation (Reduction of CC).
- ▶ (Adaptation is arguably more important?!)

- ▶ Science: Lots of uncertainty about CO₂ → Temp (climate-sensitivity) coefficient.
 - ▶ Doubling of CO₂ increases global temp by how many °C?
 - ▶ From 1 to 5, with consensus average about 2-3.
 - ▶ physics of GHG effect solo about 2.
 - ▶ range 1-5 quite possible in complex Earth
 - ▶ Humanity has increased CO₂ by 50% (280 to 420 ppm).
 - ▶ Air CO₂ will go considerably higher (to 750-850ppm).
 - ▶ ...but never to Mars (think 95% air CO₂)
 - ▶ Temporary interlude: Earth will remove human CO₂ again (but temp interludes can kill lots of life);

- ▶ Science Plus Econ: relatively better predictions of future CO₂ emission paths:
 - ▶ RCP 2.0 - 3.0 — some dreamers still believe possible.
 - ▶ **RCP 4.0 - 6.0 — realistic range**
 - ▶ +2°C to +2.5°C (above today, not preind)
 - ▶ subject to clean-E progress, econ growth, renunciation.
 - ▶ CC is coming. **Action range** is limited to about 0.5°C.
 - ▶ RCP 8.0 - 9.0 — almost surely no longer the future.
 - ▶ +3°C+
 - ▶ use only as (inferior) standin for “worse than expected” outcome
 - ▶ backward-looking, we are still on it (clean E is coming)

RCP 4: Aggressive Activism

RCP 6-7: Neglectful Complaisance

Difference: 0.3-0.5°C.

- ▶ CC will be major problem in “marginal” regions.
 - ▶ (Change itself is costly [and, slow change is inevitable].)
 - ▶ exact locations unknown
 - ▶ planet redistributes heat (e.g., through weather).
 - ▶ most net costs will probably not be in the USA or Global North.
 - ▶ some costs, some benefits, much adaptation.
- ▶ (CC is *not* the same as water shortages, species mass extinction, or biosystem collapse, although it can contribute to these problems, too.)

Grumpy Economists

- ▶ I am not making up that countries will be hurt. This is the overwhelming scientific consensus.
 - ▶ WHO: diseases, famines, etc.
 - ▶ QJE: excess deaths in the millions, mostly in Africa. (but...)
 - ▶ I have empirical evidence that hotter years have depressed growth in hot countries. See below.
 - ▶ Not only Stern, but also Nordhaus, Pindyck, etc. agree.
 - ▶ You can disagree exactly whether it is just bad or very bad. You should not disagree that the best prediction is “no harm” or that there is little uncertainty.

- ▶ Global climate change (even if 3-5°C)
 - ▶ could kill millions of people prematurely
 - ▶ poverty already kills hundreds of millions prematurely
 - ▶ will likely be bad for hundreds of millions of people,
 - ▶ but will likely only be nuisance for billions of other people.
 - ▶ there are no models in which CC is predicted to dent **worldwide** pop growth or shrink per-person forecast income.
 - ▶ Nothing is certain, though.

most OECD



most OECD

- ▶ Unlikely that the world will end due to CC.
- ▶ Not certain that the world will *not* end due to CC.
 - ▶ extremely unlikely, though no one knows for sure.
 - ▶ credible scientists do not predict it.
 - ▶ same for contagious epidemics, nuclear wars, supervolcanos, undetected major asteroids, etc.

- ▶ My own policy points below will be the same, regardless of where CC outcome will end up:
 1. between “just nuisance (small costs)”
 2. and “end of advanced civilizations (extreme costs).”

- ▶ You are welcome to an alternative educated POV,
 - ▶ but please don't try to argue scientific evidence facetiously for the sake of politics and ideology. I am not the right person for this anyway.
 - ▶ if this is what you want to, feel free to join the Heritage Institute or Greenpeace.

World Temp Map and Trend Map

Sidenote: My Own Current Empirical Work

- ▶ (Existing) Facts:
 - ▶ About 1°C avg WW warming in last 40 years.
 - ▶ Good year-to-year variation (but esp in North).
 - ▶ **Hotter years have been harmful to countries!**
 - ▶ (Adaptation could reduce future harm.)
- ▶ (Wrong Existing) Empirical Work:
 - ▶ All that mattered was poverty.
 - ▶ Geography was unimportant.
 - ▶ Shown only on margin, but also solo(!)
 - ▶ Arguably wrong specification.

(With Romain W:)

- ▶ **Weird Specification in earlier work**
 - ▶ Poorer countries have had a neg coef
 - ▶ Hotter countries (solo!) have had a pos coef
- ▶ **Correct Specification**
 - ▶ Hotter countries have *never* had a positive coef
- ▶ **Novel and Perhaps Worrisome: After year 2000**
 - ▶ Geography has become the dominant harm determinant.
 - ▶ Poverty has been carrying much little importance.
 - ▶ Inescapable harm?
 - ▶ (but long-term adaptation more related to wealth?)

2. Social Science

- ▶ **Now policy (soon), so policy questions welcome**

- ▶ Fossil fuels and particle emissions have costs and benefits.
 - ▶ Fossil fuels have serious negative externalities (PM and GW).
 - ▶ simple public goods problem.
 - ▶ Socially, collectively, world parties burn too much FF on the margin now, *relative* to a social coordinated optimum.
 - ▶ costs, benefits, redistributinal aspects.
- ▶ Tradeoffs are changing
 - ▶ externalities of fossil fuels have been becoming larger.
 - ▶ renewables are only now becoming economically viable.

Economic Workhorse Models

- ▶ Integrated Assessment Models (IAM)
- ▶ Nordhaus, Stern IAMS
 - ▶ seminal and great (but) sketch models.
 - ▶ CC is economically harmful. SCC (not /tC but /tCO₂).
 - ▶ Shadow price of emissions is \$30-\$50/tCO₂.
 - ▶ Add in CC uncertainty, shadow price is more like \$100 / tCO₂
 - ▶ convex damages
 - ▶ SCC should be rising in the future.

Textbook Treatment of IAMs

- ▶ The textbook gives explanations of different perspectives.
 - ▶ Some disagreement on discount rate etc. Too literal?
 - ▶ Nordhaus believes in “climate pacts.”
 - ▶ Fair to many different valid perspectives.

Textbook: IAMs? Really?

- ▶ Problem is not about what “we” *should* do.
 - ▶ Most current debates are local and irrelevant to CC.
 - ▶ Angels on the heads of pins (incl Lomborg and Koonin.)
- ▶ Problem is also not about blame or ethical considerations
 - ▶ development today vs less climate change tomorrow.
 - ▶ book still explains the ethics, no time here.

Textbook: IAMs? Really?

- ▶ Problem is not about what “we” *should* do.
 - ▶ Most current debates are local and irrelevant to CC.
 - ▶ Angels on the heads of pins (incl Lomborg and Koonin.)
- ▶ Problem is also not about blame or ethical considerations
 - ▶ development today vs less climate change tomorrow.
 - ▶ book still explains the ethics, no time here.
- ▶ Problem is about what “we” *will* (and *can*) do.
 - ▶ No solutions, but better or worse approaches/remedies.
 - ▶ Realistic does not mean nihilistic.

Main Point of Book, Talk, Etc

Kemosabe: What do you mean by “we”?

Main Point of Book, Talk, Etc

- ▶ We need realism. This means primarily acknowledging self-interest when self-interest is strong.
 - ▶ 1st order concern!
 - ▶ only 2nd- and 3rd-order sacrifices seem viable,
 - ▶ on a worldwide basis, not just a Euro or OECD basis.
 - ▶ climate change is about global, not local emissions

- ▶ Even many economists get upset when I lay out the evidence and talk about self-interest.
 - ▶ What if the world comes to an end?
 - ▶ How can I be so callous?
 - ▶ Seems bizarre — self-interest is at core of our discipline.
 - ▶ (A few economists have an extreme opposite reaction.)

1. Basic Changes

$\text{Emits} = N * \text{Emits}/N = N * \text{GDP}/N * \text{Emits}/\text{GDP}$
(per year, where applicable)

	1960	2022	2050e
Population	9	36	43
Emits / Person	3	4.6	4.4
GDP / Person	0.5	17.1	29.2
GDP / Emits	0.25	3.75	6.50

Population Graphs

1. CC No Longer an OECD Problem

2050-2100	OECD	Not OECD
Population	12%	88%
GDP	50%	50%
Emissions	28%	72%

Fact 1. No Longer an OECD Problem

- ▶ 2/3 of emissions today are non-OECD. 3/4 soon.
- ▶ It's not about luxury consumption.
 - ▶ "We" are no longer starring players.
 - ▶ USA is ultimately not primarily causing Δ CO₂ in air.
 - ▶ India now matters more. (China matters, but is done.)
 - ▶ If Africa were to develop, much worse. (Pop growth.)
- ▶ Climate activists' main focus on shooting ourselves in the foot has little chance to curb CC and Temp.
 - ▶ they care too much about OECD, ESG, and righteousness.

Fact 2. Humanity is not the BORG.

- ▶ (Worldwide SCC = Net Cost is never applicable to us.)
 - ▶ Req: 1 mo rent (worldwide), 3-6 mos if OECD alone.
 - ▶ “Who” is often left badly vague even in talks.

The SCC is practically irrelevant.

- ▶ It would hurt...quite a bit.
- ▶ There will be no climate pacts.
- ▶ There will be no (WW) consumption renunciation.
- ▶ There will be no generational commitments.

Need It More Obvious?

Spend all military expenses on CC instead?

- ▶ Discuss any more obvious dreams / absurdities?
- ▶ I know of no free-rideable treaty with major sacrifices ever voluntarily widely (WW?) adopted?
 - ▶ painful implementation is not the same as “babble at COPs”
 - ▶ Montreal Ozone is *not* a counter-example.

Easy Blurps For Non-Economist Relatives

1. Countries have militaries for the same reason why they will not decarbonize.
2. Arguing about whether a nuclear war will kill 1 or 5 billion people is irrelevant.
3. Arguing about the optimal world choice is irrelevant.
4. Arguing about what can realistically be done *asap* to reduce the probability of nuclear war may not be ideal but it is the only relevant discussion.

Too obvious?

Easy Blurps for Economist Relatives

- ▶ Why are you analyzing the socially optimal worldwide amount of military expenditures, as if there was one entity?

Revealed Preference

As of 2020s, three decades by now:

- ▶ World can suck out at $< \$10/\text{tCO}_2$ *on the margin* today. Who is volunteering to pay?
- ▶ Spending a lot more today due to concern about going beyond the margin seems sysiphean.
 - ▶ some research funding for better ideas seems ok
- ▶ Who wants to pay to suck out China's and India's increasing GDP emissions?

- ▶ Which developed country voters will say “it was our fault, let’s transfer tens of billions of dollars to other countries?”
 - ▶ Who cares about the small EU?
 - ▶ And even EU doesn’t really do it much, either.
- ▶ Which developing country voters will say “it was their fault, but they are now cutting back, so we shouldn’t emit (our”fair” share), either?”

Hopeless Economic Misanalysis (IMHO)

- ▶ Everything hivemind renunciation related.
 - ▶ Carbon Footprints.
 - ▶ Belt-Tightening in OECD.
 - ▶ Plastic straws and garbage sorting are wealthy salon insights.
 - ▶ (PS: I am not against reducing plastic straws.)
 - ▶ United Nations COP conferences
 - ▶ The Montreal Ozone Protocol is not an analogy.

Do you really want to count on world-wide painful renunciation of consumption and/or vast transfer payments to reduce global emissions and global warming?

Not local, but global emissions.

Top Choices

Sector Emissions and Fuel Type Histories

Top Choices

Must have a chance to be implementable

- ▶ Of course, even the best remedies will not happen without resistance by incumbents,
- ▶ but *The Force* should or could ultimately prevail!
 - ▶ Economics is *The Force*.
 - ▶ But this is “cosmic.” Government is everywhere, esp in energy (for good reasons). Ever difficult balancing.
 - ▶ (Some rich people and governments can of course shoot themselves in their feet. But 6 billion poorer people will not.)

1+2: Realistic Remedies

1. Must work around the world.
 - ▶ Not all places are the same.

1+2: Realistic Remedies

1. Must work around the world.
 - ▶ Not all places are the same.
2. Must work over decades and generations.

1+2: Realistic Remedies

1. Must work around the world.
 - ▶ Not all places are the same.
2. Must work over decades and generations.
3. Must not be too much against self-interest.
 - ▶ A little against self-interest may be politically ok.

1+2: Realistic Remedies

1. Must work around the world.
 - ▶ Not all places are the same.
2. Must work over decades and generations.
3. Must not be too much against self-interest.
 - ▶ A little against self-interest may be politically ok.
4. Must be able to sustain majority support.

1+2: Realistic Remedies

1. Must work around the world.
 - ▶ Not all places are the same.
2. Must work over decades and generations.
3. Must not be too much against self-interest.
 - ▶ A little against self-interest may be politically ok.
4. Must be able to sustain majority support.
5. Needs to work for 6-7 billion people in China, India, other Asia, and Africa.
 - ▶ Who cares about Sweden?
 - ▶ USA? UK? Imperial?

Quick Abbreviated Tour of Tech

Ask Me About Details Over Coffee
(or correct my facts if wrong)

Rem 1. Clean Energy is Tantalizingly Close

Viable useful activism: subsid clean energy innovation

- ▶ But like all government X, difficult and conflicted.
- ▶ Vast international commercial opportunities for innovators.
- ▶ Clean Elec is (**cosmically**) tantalizingly close
 - ▶ please stop “net-zero” stupidity.
 - ▶ net-10% is good enough and much *much* cheaper.

Clean Energy is about more than CC

Fossil fuels are nasty stuff.

- ▶ They kill millions with their particle emissions,
- ▶ but they are why *you* (and G Thunberg) expect to live to 80, and sit in this nice room.
- ▶ FF time is passing now. It seems highly efficient to speed up their demise with subsidies for R&D into clean E.
 - ▶ Nordhaus' "Double Externality"

Electricity Generation in 2030/2050:

- ▶ 1 MWh of Dirty/Nuclear Energy: \$50-\$100/MWh
 - ▶ nuclear, too, even outside the US and Germany
 - ▶ I would love better nuclear, (too,) but ...
- ▶ What do you think the equivalent clean energy costs are in 2023? Expected to be in 2050?

Clean LCOEs in 2023 and 2050e

- ▶ In the USA in 2023, wind, solar, and Natgas all sit between \$40 and \$100 already.
 - ▶ location matters to installation.
- ▶ 1 MWh of clean energy in 2050e: \$15-\$20/MWh
 - ▶ but only when nature cooperates,
 - ▶ ...and that ain't enough.

- ▶ Electricity storage is the key problem
- ▶ Right now, storage cost is falling below \$200/MWh.
 - ▶ Situation seems almost absurd for day-to-day experience.
 - ▶ Imagine if oil cost \$1/barrel to burn now, but \$10 / barrel to store until 8pm.
 - ▶ Imagine if dinner cost \$1 to eat now, but \$10 to pack.
- ▶ But even with today's storage costs, diurnal wind and solar power are already cheaper in *many, many* places.

Policy

- ▶ Help subsidize how to store 1 MWh for $< \$100/\text{MWh}$ and then let capitalist competition do its job.
 - ▶ ok, still needs grid coordination fixes. ***BIG PROBLEM***
 - ▶ plus, nothing about energy can be pure free markets.

Fossil Fuels for Electricity Plus

- ▶ **NatGas:** Most competitive fossil fuel for Elec and Heat.
 - ▶ Yet, solar PV is already becoming cheaper than NatGas fuel for existing plants in the United States. *Wow!*
 - ▶ ...and this was before 2022 (and Ukraine)!

- ▶ **Coal:** No entrepreneur in the OECD has built a new electricity coal plant in decades.
 - ▶ Ironically, coal is no longer a capitalist outcome!
 - ▶ Coal is heavy to schlepp and expensive to clean up.
 - ▶ Coal now lives off unions and government regulation.
 - ▶ China (India) are building massive new plants now.
 - ▶ Nothing in E is without government involvement!

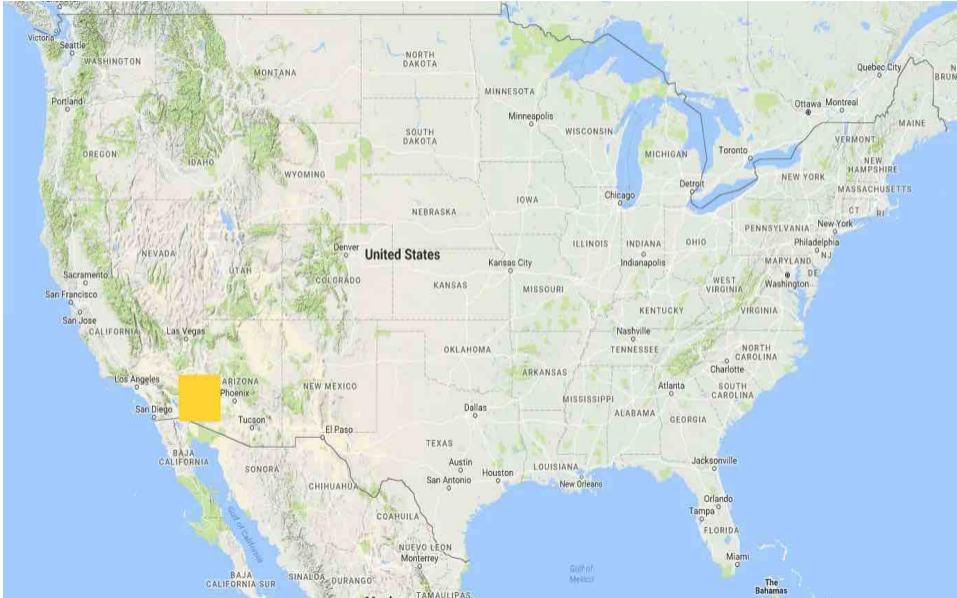
▶ **Oil**

- ▶ will probably be uncompetitive in grid-adjacent ground transport soon
- ▶ niche: long-term off-grid transport, chemical products, etc.

(Good Question: Will FF remain the cheapest heat source.)

- ▶ PS: Please don't Believe Propaganda and Dogma.
 - ▶ I don't have time to dispell many here. (See book.)
 - ▶ (Who cares if windmills are buried later?)
 - ▶ (Who cares if solar PV needs size of Massachusetts?)
 - ▶ (Who cares if capitalists get richer?)
 - ▶ (Who *really* cares about the poor on Bangladesh's coast? Not a callous statement but a genuine question.)

Little Mass



Unlikely Solutions

- ▶ *Current* nuclear tech is niche, at best.
 - ▶ Safety, spent fuel, proliferation, mass production.
 - ▶ Regulatory and public hostility
 - ▶ BUT it's *not* mostly about US regulatory hostility.
 - ▶ See France, USSR, China, Ukraine, Korea, Japan, Mexico, etc.
 - ▶ Even already-built plants still incur \$40-\$50/MWh marginal cost! They are now often closing down early at \$50/MWh.
 - ▶ It's mostly about cost competitiveness (NatGas, E-Storage)
 - ▶ Promising: FOAK in Wyoming (big subsidies!). Pebble-bed reactor. Small reactors. etc. R&D = good. Install = bad.

- ▶ Hydrogen seems outright stupid as E-storage.
 - ▶ Had real hope and excitement, but
 - ▶ even if cost declines by factor of 3, NatGas dominates
 - ▶ even if electricity were free, H is not competitive to NatGas.
 - ▶ badly corrosive on transport, too.
 - ▶ Whatever El will cost, batteries and heat storage are/will likely store El much cheaper for output as El or Ht
 - ▶ Future niche for hydrogen only in long-range transport.
 - ▶ Possible niche with epsilon E in very long run. Who knows.
 - ▶ Huge IRA subsidies in US

- ▶ Industrial CO₂ sequestration is outright stupid.
 - ▶ Only P.R. and “stupid government regulations” arbitrage.
 - ▶ see below for cheaper better seq alternatives
 - ▶ Huge IRA subsidies in US

Rem 2. Regional Fossil Fuel Taxes

- ▶ (Viable in many places!)
- ▶ “This stuff kills your parents and children!”
- ▶ It makes spending outdoors less desirable.
 - ▶ Clean air is a luxury good.
 - ▶ Very visible and noticeable.
 - ▶ Would you prefer 5% more income if you had to suffer Beijing-like smog and air? Not me. Not most.
 - ▶ Still tough to implement. See Delhi.

Rem 3. Smart Regreening (Everywhere)

- ▶ Timber is valuable. Also, hemp, seaweed, etc.
 - ▶ Wood and bamboo are amazing materials. At half price...
- ▶ Available cultivatable land is abundant worldwide.
 - ▶ But it's not in the Amazon and Indonesia.
 - ▶ Gvnmts could lease out land with credits for CO₂.
- ▶ Think \$10/tCO₂ *on the margin* for 1t/CO₂.
 - ▶ \$30/tCO₂ not for 50 GtCO₂/Yr, but for 5 GtCO₂/Yr.
 - ▶ Who cares about 30 years from now? **Care about Now!**
 - ▶ “Growing smartly” is super low-hanging fruit.
 - ▶ Failure is indicative of world coordination & commitment.

4. Many Other Cheap Improvements (OECD)

- ▶ Time-of-Day Pricing
 - ▶ Big problem is 6-10pm. So make electricity near free when it's sunny, and signal this over the networks.
 - ▶ Great for poorer energy-conscious consumers.
 - ▶ Crazy Time-of-Day Plans in many places.
- ▶ Improve Electrical Grid.
 - ▶ Logistical and regulatory nightmare.
- ▶ Concierge Service for Government Permits
 - ▶ 10 years to start a low-impact mine?
 - ▶ Almost impossible for many entrants.

PLEASE ENVIRONMENTALISM: STOP STUPID

- ▶ Universities: Invest in clean-energy research chairs and labs. Reduce ESG & vehicle electrification focus.
- ▶ Economists: Stop focus on arguments about the SCC.
- ▶ Companies: Commercialize E-gen and E-storage tech.
- ▶ Activists: Promote clean air standards worldwide. Drop anti-capitalist attitudes. Coopt capitalism.
- ▶ Government: Price Elec. Improve El-Grid. Coordinate. Reduce Red Tape (faster, not laxer). Lease out land.

Apologies on Wish List

- ▶ Ignores realist hindrances:
 - ▶ admittedly hypocritical (“world as it is”)
 - ▶ but more feasible
- ▶ Hindrance Examples:
 - ▶ Investors and activists need to swear allegiance to ESG.
 - ▶ Necessary PR and useful customer marketing.
 - ▶ Politicians may need to hold coalitions together.
 - ▶ University administrators fear cancellation.
 - ▶ Activists want to go to the pub with like-minded.

Thanks For Listening

- ▶ What is there to argue about that truly matters right now and that has a good chance of success *world-wide*?
- ▶ What could environmentalists be doing more smartly?
- ▶ Much more detail and backup in our free textbook.

- ▶ Resources
 - ▶ <http://climate-change.ivo-welch.info/>
 - ▶ <https://www.climate-change.ivo-welch.info/home/16-cribsheet.html>