



# CLIMATE CHANGE:

ISSUES AND  
PERSONALITIES

An enquiry into the science  
and the personalities that  
drive the discussion

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# Why am I qualified to talk on this topic?

- ▶ I have extensive training in the biological sciences
- ▶ But not meteorological sciences
- ▶ I am trained in statistical analysis and peer review methodology
- ▶ I am opened minded and committed to hard scientific data
- ▶ I have followed the issue for many years
- ▶ I have no financial interest in the issue of global warming

# Outline of My Presentation

- ▶ Nature of the Beast: What is Climate Change?
- ▶ Unanimity of Opinion
- ▶ Some prominent personalities involved in the discussion
- ▶ Pros and Cons
- ▶ What is the motivation of individuals involved in this debate?
- ▶ A way forward



# What is Climate Change?

- ▶ **Climate change:** any significant long-term **change** in the expected patterns of average weather of a region (or the whole Earth) over a significant period of time.
- ▶ **Day to day weather variation** is NOT climate change. It is WEATHER.



# UNANIMITY OF OPINION

- ▶ **1. Global rise in surface temperature**
- ▶ **2. Sea level rising**
- ▶ **3. Snow cover retreating**
- ▶ **4. An 800,000-year-old record**
- ▶ **5. The sun isn't getting hotter**

# Debating Climate Change:

Is it possible to have meaningful exchanges on “hot button” issues? Probably not.



# Some of the prominent figures in the field and their views

- ▶ Many have no scientific training, let alone training in climate science.
- ▶ Their views are important because they sway public opinion.
- ▶ Many scientists don't communicate their findings effectively.
- ▶ The central question is: If climate change is a real phenomenon, and if the scientific evidence is incontrovertible, why do “contrarians” or “deniers” exist?
- ▶ THAT is the real issue.



# JAMES HANSEN



University of Kyoto and Department of Astronomy, University of Tokyo. Began work at the Goddard Institute for Space Studies in 1967.

77 year old retired NASA scientist, first stated to US congressional hearing in 1988 that a recent sharp rise in temperatures was a result of human activity. Born in Denison, Iowa, trained in physics and astronomy in the space science program of James Van Allen at the University of Iowa. Ph.D. in Physics in 1967, participated in the NASA graduate traineeship from 1962 to 1966 and, visiting student at the Institute of Astrophysics , University of Kyoto and Department of Astronomy, University of Tokyo. Began work at the Goddard Institute for Space Studies in 1967.

# Richard Lindzen

American atmospheric physicist known for his work in the dynamics of the middle atmosphere, atmospheric tides, and ozone photochemistry.

Published more than 200 scientific papers and books

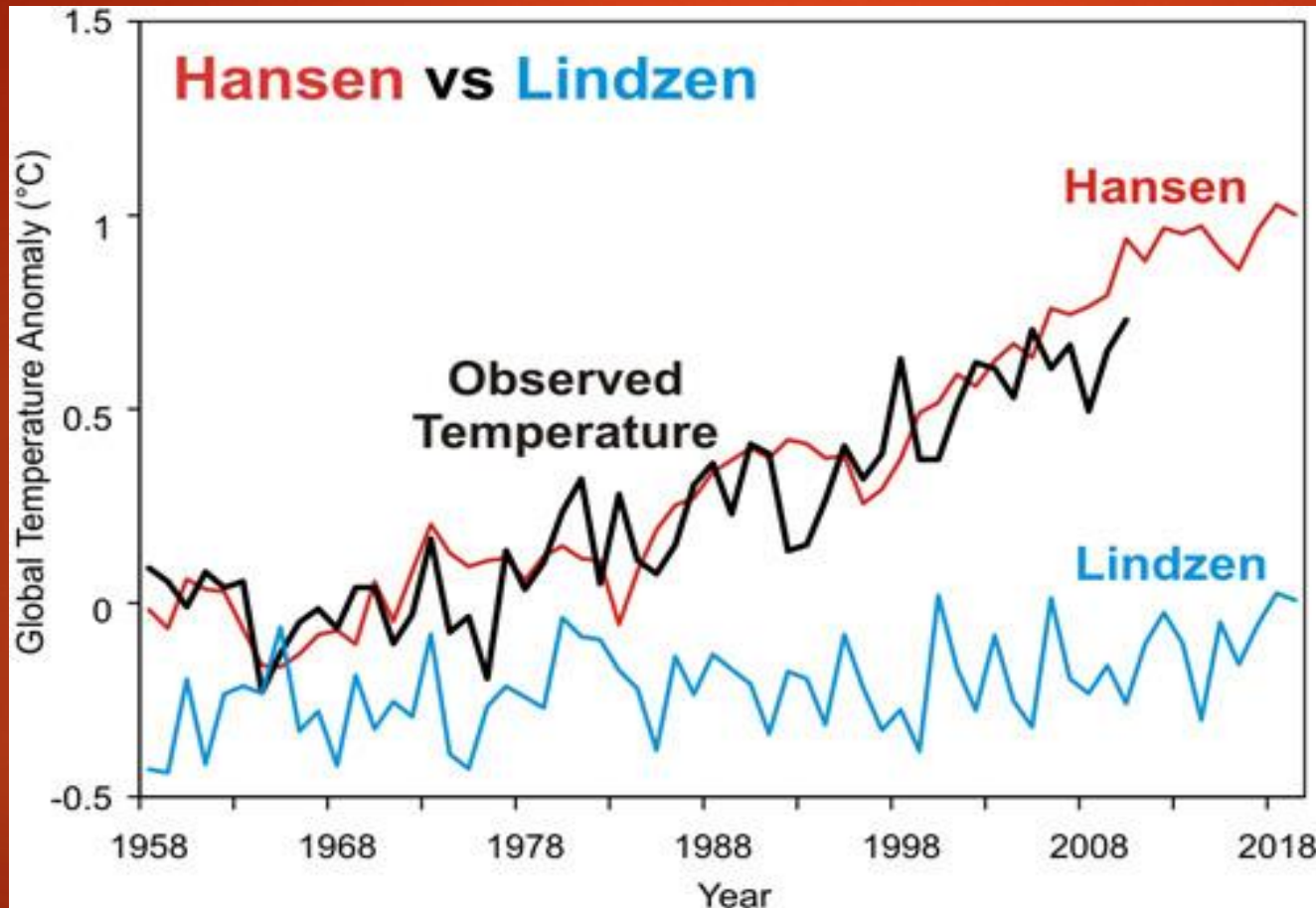
Alfred P. Sloan Professor of Meteorology at the Massachusetts Institute of Technology.

Criticized the scientific consensus on climate change, calling it "climate alarmism."

Published numerous articles for the Cato Institute, has received at least \$125,000 from ExxonMobil since 1998. Paid \$2,500 per day oil and coal organizations for his consulting services.



# Hansen versus Lindzen on Predicted Increases in world average Temperature



Comparison of the observed GISTEMP temperature record (black) with temperature predictions from Dr. James Hansen's 1988 modeling study (red), and with our reconstructed temperature prediction by "skeptic" climate scientist Dr. Richard Lindzen based on statements from his talk at MIT in 1989 (blue). Lindzen's statements of low climate sensitivity were used to reconstruct what his temperature prediction might have looked like as described here

# Controversy!



Lindzen has been harshly criticized by many highly qualified climate scientists:

“As his colleagues at MIT in the program in atmospheres, oceans and climate, we write to make it clear that this is not a view shared by us, or by the overwhelming majority of other scientists who have devoted their professional lives to the careful study of climate science.”

Lindzen argues that we should be equally sceptical about **both climate change and the link between smoking and cancer**. If you accept Lindzen’s view that the two arguments are comparable, you reach the conclusion that the link between human activity and climate change is now so well-established that it makes about as much sense to doubt it as to doubt the relationship between smoking and lung cancer, that is, **no sense at all**.

A notable fact about the professional climate sceptics is that many of them (Singer, Seitz, Milloy and so on), are also paid advocates for the tobacco industry. **BUT**, there’s no evidence to suggest that Lindzen is acting from mercenary motives. It appears that he’s just acting as a matter of temperament.

# Katharine Hayhoe, Ph.D.

Professor at Texas Tech University and Director of the Climate Science Center at Texas Tech.

Research focuses on developing and applying high-resolution climate projections to evaluate the future impacts of climate change on human society and the natural environment.

Served as lead author on key reports for the U.S. Global Change Research Program and the National Academy of Sciences.

Serves on the University Corporation for Atmospheric Research President's Advisory Committee on University Relations and the National Center for Atmospheric Research Walter Orr Roberts Distinguished Lecture Committee.

Chairs the Earth Science Women's Network Advisory Council, and also serves on the Smithsonian National Museum of Natural History's Anthropocene Advisory Council, the American Geophysical Union's Climate Communications Prize Committee, and the advisory board for the American Association for the Advancement of Science.



# Hayhoe Quote

- ▶ *"It's a vicious cycle. The more doom-filled reports the scientists release, the stronger the push back from politicians whose power, ideology and funding depends on maintaining the status quo, and who are supported by those who fear the solutions to climate change more than they fear its impacts."*
- ▶ *"Opposition to climate change is a symptom of a society that is politically polarized between those who cling to the past and those who recognize the need for a better future. Fossil fuels have brought us many benefits — and I'm grateful for their contribution to my life — but the solution to our current crisis is to stop using them. That change can be scary, especially for those with most to lose financially from this shift. If you feel threatened, the instinctive reaction is to push back."*



# David Icke,

## Climate change denier, Holocaust denier

- ▶ **David Vaughan Icke** (born 29 April 1952) is an English professional conspiracy theorist and former footballer and sports broadcaster. He is the author of over 20 books and numerous DVDs and has lectured in over 25 countries, speaking for up to 10 hours to audiences. Critics have accused Icke of being a Holocaust denier and antisemite, claims he denies.
- ▶ On a BBC television show in 1991 he declared "The world as we know it is about to end". Amid laughter from the audience, Icke demurred when asked if he was the son of God, replying that Jesus would have been laughed at too, and repeated that Britain would soon be devastated by tidal waves and earthquakes. When Icke said laughter was the best way to remove negativity, Wogan (his BBC host) replied of the audience: "But they're laughing *at* you. They're not laughing with you."



# Michael Mann

One of the most recognized climate scientists in the world.

Expert on climate modeling and human-caused climate change.

Received a number of honors and awards including NOAA's outstanding publication award in 2002 and selection by Scientific American as one of the fifty leading visionaries in science and technology in 2002.

190 peer-reviewed and edited publications, Many books.

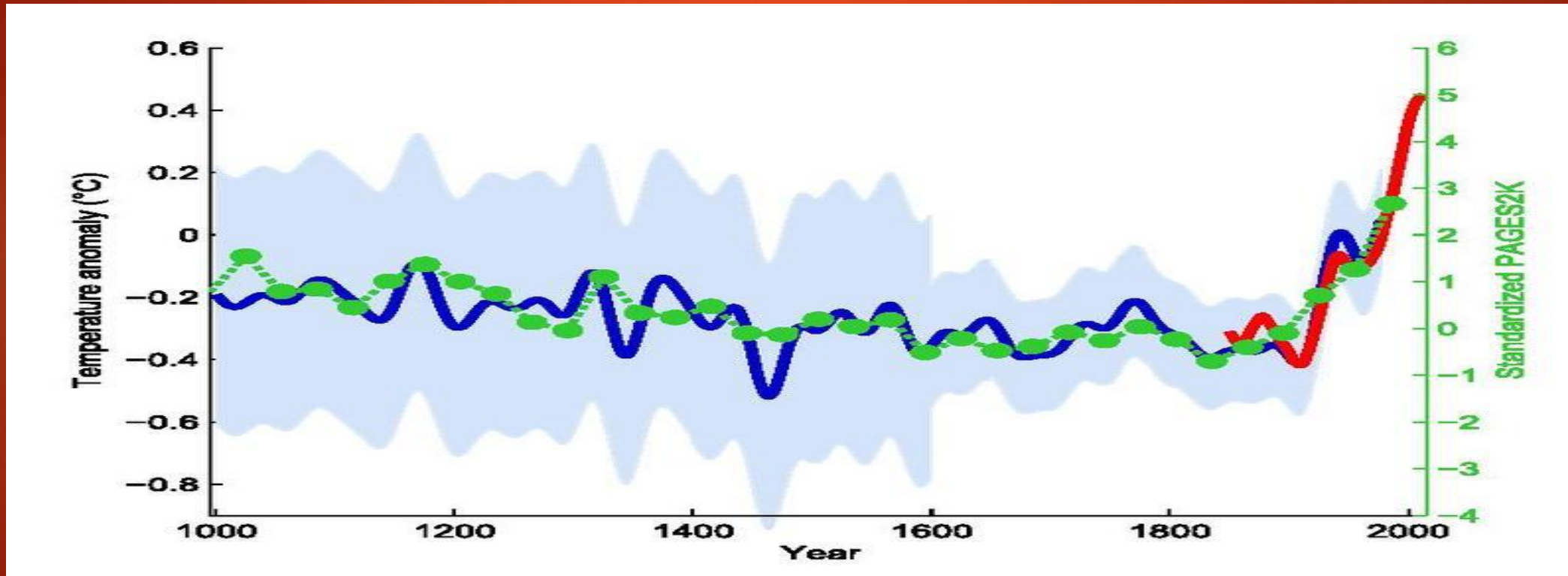
Co-founder of the award-winning science website [RealClimate.org](http://RealClimate.org).





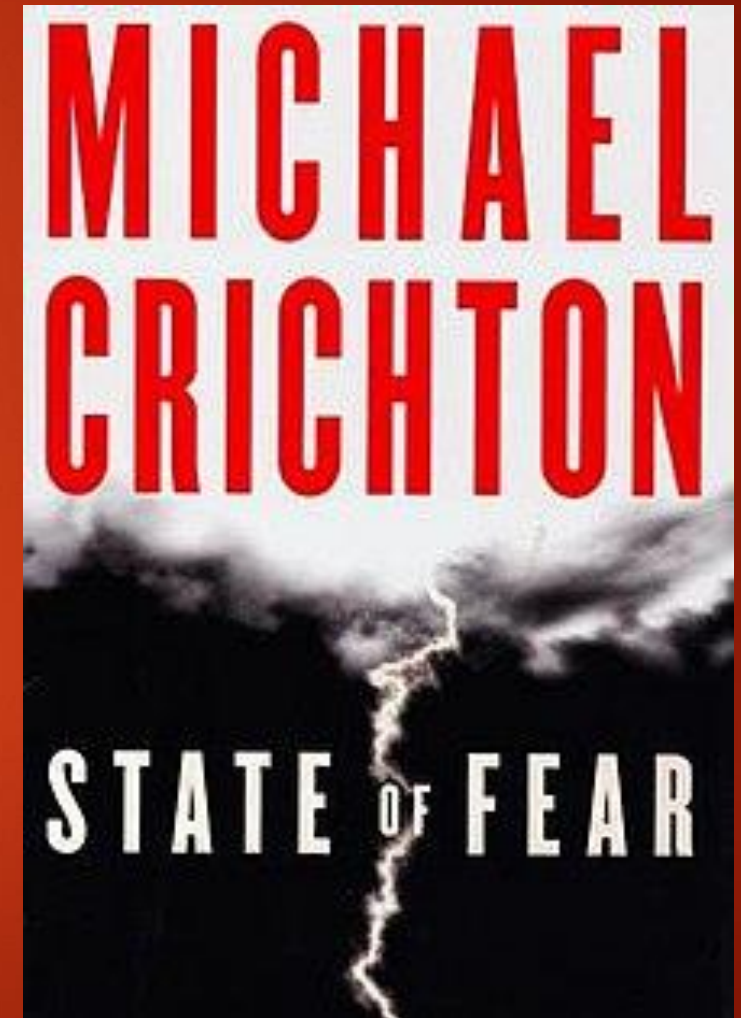
# The Hockey Stick

- ▶ This is Mann's most significant contribution



# Hockey Stick was very controversial

- ▶ In a CBS News opinion piece, Senator James Inhofe (OK) had extensively cited Michael Crichton's fictional thriller, *State of Fear*, mistakenly describing Crichton as a "scientist".



# Senator James Inhofe (OK)

Rejection of the scientific consensus on climate change.

Supports a constitutional amendment to ban same-sex marriage.

Proposed the Inhofe Amendment to make English the national language of the United States.

Brought a snowball into the senate chamber, saying that it refuted global warming

Inhofe has received over \$529,000 from the oil and gas industry since 2012.



# Inhofe's Flying Prowess

- ▶ On October 21, 2010, at the age of 75, Inhofe landed his Cessna on a closed runway at a south Texas airport, scattering construction workers who ran for their lives.
- ▶ the airport manager, also speaking to the FAA , opined: "I've got over 50 years flying, three tours of Vietnam, and I can assure you I have never seen such a reckless disregard for human life in my life. Something needs to be done. This guy is famous for these violations"
- ▶ Something was done. Inhofe sponsored a "Pilot's Bill of Rights" in the senate to protect pilots from the FAA.

# A Never Ending Controversy

- ▶ More than two dozen reconstructions, using various statistical methods and combinations of proxy records, have supported the broad consensus shown in the original 1998 hockey-stick graph.
- ▶ The 2007 IPCC Fourth Assessment Report cited 14 reconstructions, to support its conclusion that it was likely that Northern Hemisphere temperatures during the 20th century were the highest in at least the past 1,300 years.
- ▶ Over a dozen subsequent reconstructions, including those by Mann et al. support these general conclusions.

# Michael Crichton

Incredibly successful writer; died 2008 from lymphoma.

Attended and graduated from Harvard Medical School, but did not take his boards

Invited by President George Bush to the White House because of his expertise as a climate scientist.

Wrote "State of Fear", a fictional novel about evil environmentalists who are trying to commit acts of climate destruction in order to convince the public that global warming is occurring (when in fact Crichton proves that climate change is nonsense).



# At One Time Crichton Had.....

- ▶ The number 1 show on TV (ER)



# AND.....

- ▶ The number 1 book (Jurassic Park)
- ▶ AND
- ▶ The Number 1 movie (Jurassic Park)





# Crichton testifies to Congress on global warming, 2005

- ▶ Outside the committee room, Peter Saundry, executive director of the National Council for Science and the Environment, said he was bemused by Crichton's apparent position. "If you read his book, you are left with the impression that environmentalists are only one step up from the sort of people who will cross the road to murder your children, but then you get to the author's note at the back and he makes this statement saying he is not a climate change denier. It's hard to know what his position is."



# Siegfried Fred Singer

- ▶ 95 year old Austrian-born American physicist and emeritus professor of environmental science at the University of Virginia.
- ▶ Trained as an atmospheric physicist and is known for his work in space research, atmospheric pollution, rocket and satellite technology
- ▶ Questions link between UV-B and melanoma rates,
- ▶ And between chlorofluoro compounds and stratospheric ozone loss
- ▶ Downplayed health risks of passive smoking
- ▶ Downplayed threat of acid rain and has been labeling acid rain as a fake crisis since then.
- ▶ Advocate for climate change denial



# Singer has been consistently wrong over and over again:

- ▶ "Contrary to both global-warming theory and climate models, data from weather satellites show no atmospheric temperature increase over this period [1978 to 1997], and neither do the entirely independent radiosondes carried in weather balloons."

## ▶ **BUT:**

- ▶ The most recent satellite data show that the earth as a whole is warming



# Roy Spenser

Principal research scientist, University of Alabama in Huntsville:

U.S. Science Team Leader for the Advanced Microwave Scanning Radiometer (AMSR-E) on NASA's Aqua satellite.

Most important contribution: work with the satellite-based temperature monitoring for which he and Dr. John Christy received NASA's Exceptional Scientific Achievement Medal.

Argues that global warming is mostly due to natural internal variability, and that the climate system is quite insensitive to humanity's greenhouse gas emissions.

"It is a little known fact that the extra carbon dioxide (and methane, an especially potent greenhouse gas) emitted by joggers accounts for close to 10% of the current Global Warming problem."



# Susan Solomon

Professor of Environmental Studies in the Department of Earth, Atmospheric and Planetary Sciences UC Berkeley

Best known for hypothesis that the hole in the ozone layer of the stratosphere that had opened up was the result of interaction with man-made chemicals, especially chlorofluorocarbons (CFCs), widely used at that time in refrigerants

The ozone layer protects all living things from otherwise lethal levels of ultraviolet radiation from the sun.

Led a team to Antarctica to take samples to test her hypothesis — which was confirmed. As a result, an international agreement was reached in 1989 to ban CFCs for commercial uses.

Since then, the ozone hole has stopped growing and begun to shrink.



# Kelvin Droegemeier,

Oklahoma Secretary of Science and Technology, grins in Oklahoma City. Droegemeier has been nominated to be director of the White House Office of Science and Technology.

Droegemeier, an expert on extreme weather has served as The University of Oklahoma's vice president of research since 2009 and has conducted atmospheric research for over 35 years. His extensive background in weather provides some hope among the science community that he can influence the administrations views on climate change



# Steve Milloy Juris Doctorate, University of Baltimore.

No training in climate science.

Director of External Policy and Strategy at Murray Energy Corp, largest privately-owned coal producer in the United States from October 2013 until May 2015. Senior Policy Fellow at the Energy & Environment Legal Institute.

In both 2000 and 2001 Milloy charged Philip Morris \$92,500 in fees and expenses for his consulting work.

"I do have a bias," Milloy told *The New Yorker*. "I'm all for the coal industry, the fossil-fuel industry. Wealth is what makes people happy, not pristine air, which you'll never get."

"Coal is ground-zero in the environmental wars, and it is the most important battle that we're fighting today. I am going to talk about the need for coal and then discuss the wanton and reckless smearing and elimination of it.

"Democrat dirty tricks were able to drive the heroic Joe McCarthy to an early grave. Democrat dirty tricks forced Nixon to resign."



# Bjørn Lomborg

Danish author, President of his think tank, Copenhagen Consensus Center.

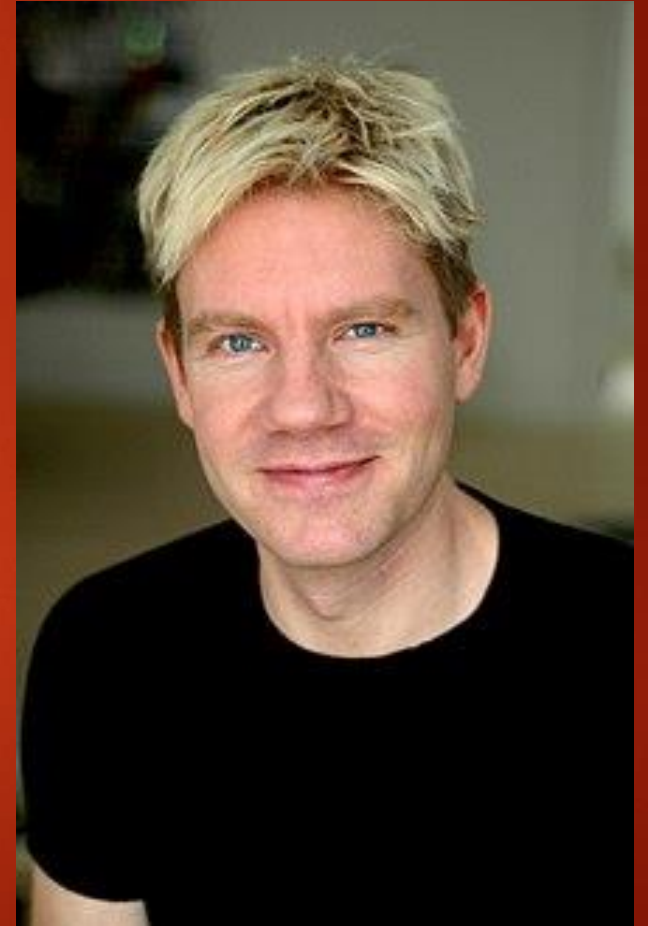
Former director of the Danish government's Environmental Assessment Institute (EAI) in Copenhagen.

Internationally known for his best-selling and controversial book, The Skeptical Environmentalist (2001)

Accepts global warming as a reality.

Argues that measures adopted by world leaders to meet the challenges will be extremely costly and have minimal impact on the world's rising temperature.

Advocates focusing attention and resources on what he perceives as far more pressing world problems: AIDS, malaria and malnutrition. In his critique of the 2012 United Nations Conference on Environment and Development, stated: "Global warming is by no means our main environmental threat."





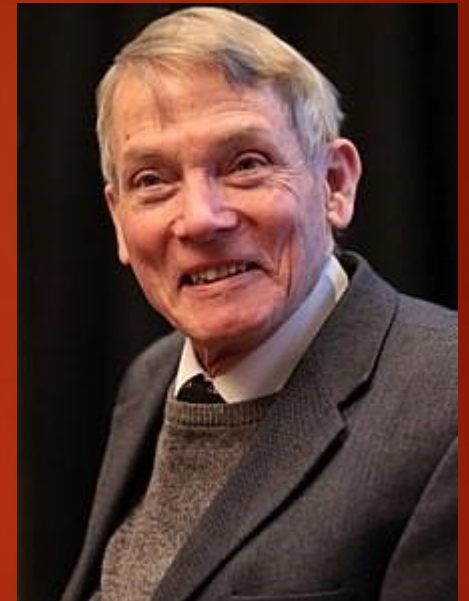
# Dr. Wil Happer

A well known atomic physicist, 80 years old, was President Trump's advisor on climate change, defender of the virtues of carbon dioxide, and naysayer concerning the reality and risks of climate change.

Developed a strong international reputation for experimental work using the technique known as optical pumping, in which laser light is used to pump atomic or molecular species up into selected excited quantum states.

*"The demonization of carbon dioxide is just like the demonization of the poor Jews under Hitler. Carbon dioxide is actually a benefit to the world, and so were the Jews."* [Quote from 2014 CNBC interview of Happer.]

*"[Concern about climate change is] another one of these sort of mass hysterias that have gripped humanity since it began. More sinister are these movements in Europe: the fascists, the communists. They were mass hysteria too...Any movement can be captured by thugs, and that's what's happened."*



# The evil deeds of climate scientists have no bounds

Happer claims: *“A major problem has been the co-option of climate science by politics, ambition, greed, and what seems to be a hereditary human need for a righteous cause. Happer’s implications are that:*

(a) the thousands of climate scientists who have participated in the IPCC and U.S. national models and assessments of global climate are all in it for the money or the glory, while

(b) climate change deniers are pure of motive and starved of support by wealthy foundations.

(c) Happer was hired by Trump to head a White House panel to deny climate change. He was forced to resign by members of Trump’s staff a few weeks ago.



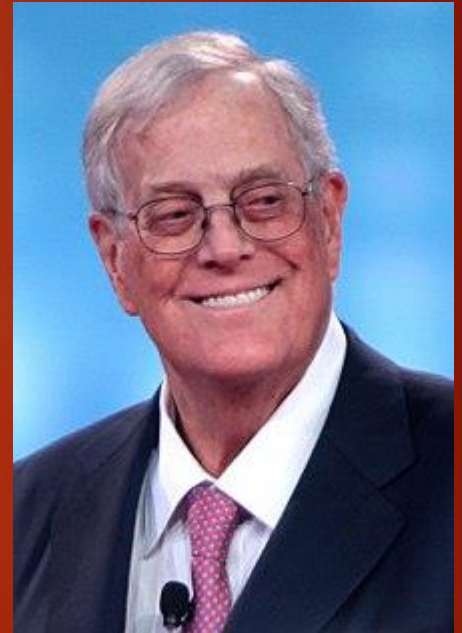
# THE KOCH NETWORK

a massive political funding apparatus: Koch Industries has Revenues \$110B/annum



Charles

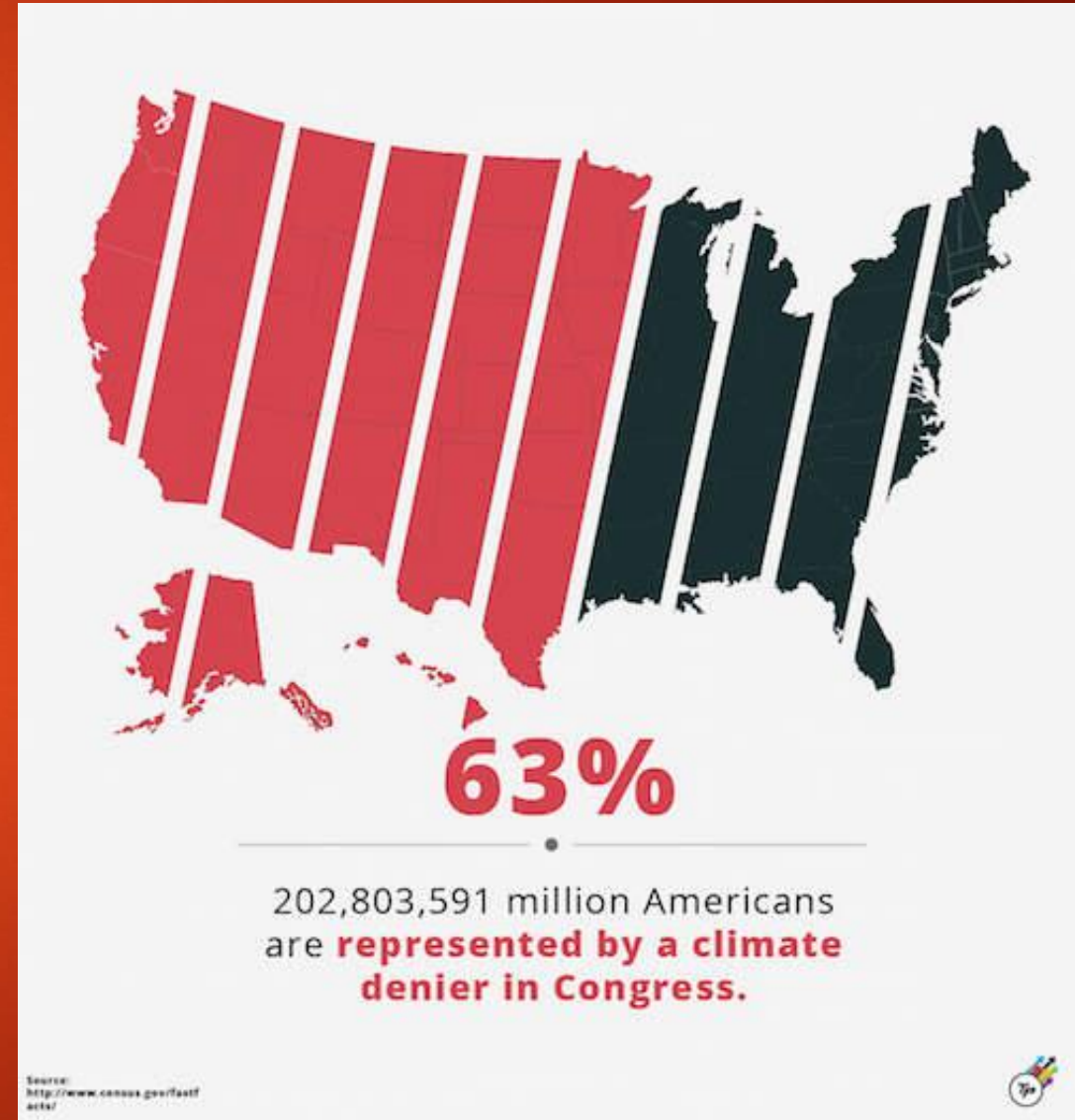
- ▶ Huge financial contributions to libertarian and conservative think tanks and Republican Party candidates. Spent \$889 million from 2009–2016.
- ▶ Funds organizations that contribute to Republican candidates, and lobbies against efforts to expand government's role in health care and climate change mitigation. By 2010 donated more than \$100 million to dozens of free-market and advocacy organizations.
- ▶ David Koch's death will have no impact on the political strategies of the Koch network or the operation of the corporation. Charles Koch has always been the center of gravity for that, not David.
- ▶ The machine will continue to go forward as it has, even without David Koch at the forefront.



David

# What motivates the Deniers?

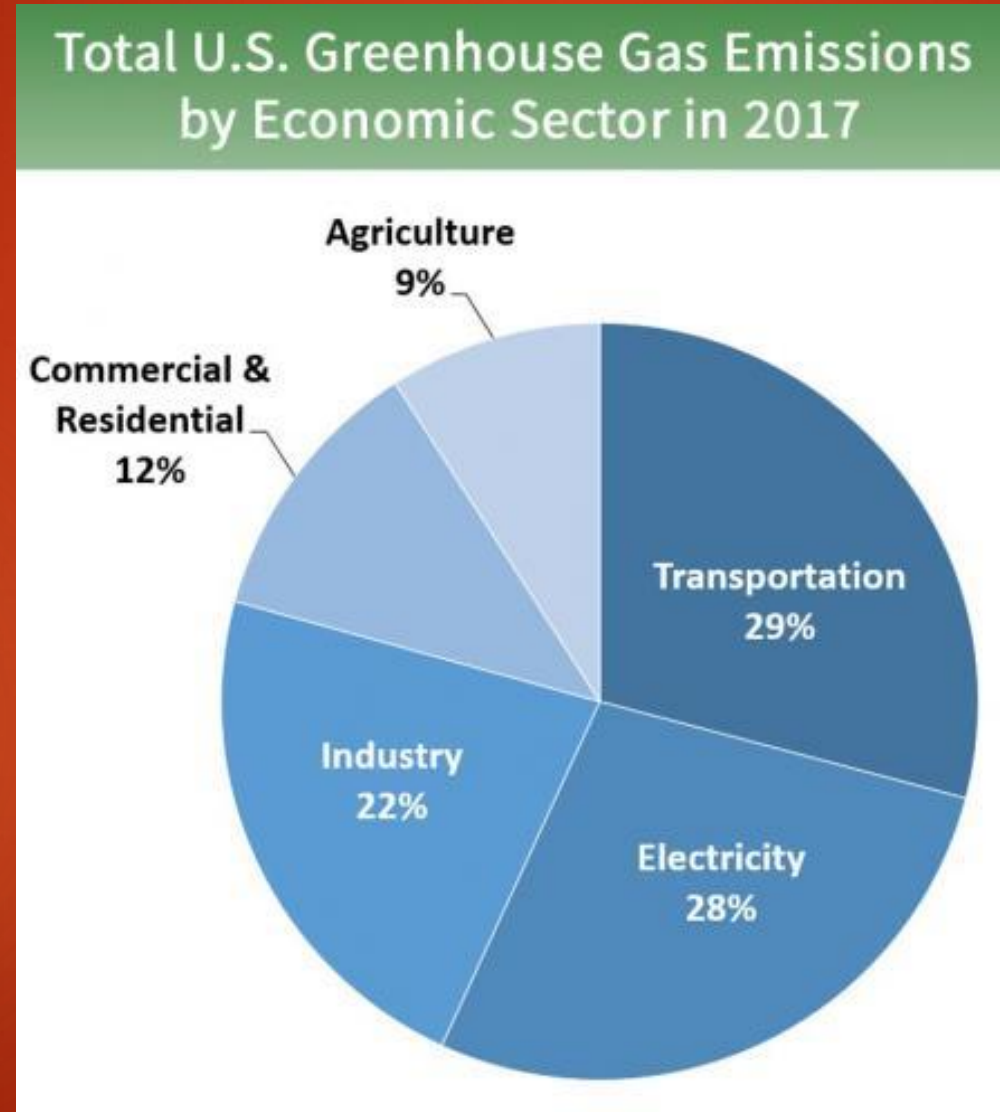
- ▶ 1. Money
- ▶ 2. basic contrarian philosophy
- ▶ 3. Inability to back off a long-held but inaccurate view
- ▶ 4. Desire to be the center of attention
- ▶ 5. Desire to be taken seriously
- ▶ 6. Effort to justify right wing view point that “the government can’t do anything right”; since combatting climate change would require massive government intervention, it must be that there is no problem requiring massive government intervention.



# A Way Forward



# Where Does CO2 Come from ?



# Individual Choices

1. Do nothing

2. Individual Choices

Low, medium, high

3. Societal choices

# 1. Do Nothing

Extensive polling and data analysis have demonstrated that doom and gloom presentations of climate change don't mobilize action

Audiences simply get depressed and adopt a fatalistic response. "Masque of the Red Death" reaction

So what are the possible paths that we can pursue, individually and as a society?





# 2. Individual Choices



# Personal choices to reduce your contribution to climate change

\* Cumulative emissions from descendants: increases substantially if national emissions decrease.

Average values for developed countries, based on current emissions.



Annual climate savings (tCO<sub>2</sub>e)

Low Impact

< 0.2 tCO<sub>2</sub>e

Moderate Impact

0.2-0.8 tCO<sub>2</sub>e

High Impact

> 0.8 tCO<sub>2</sub>e

# The solution to climate change that dares not speak its name



Having one fewer child is by far the most effective step a person in a developed country can take to reduce their carbon footprint, one 2017 study found.

# SECOND LARGEST CONTRIBUTION:



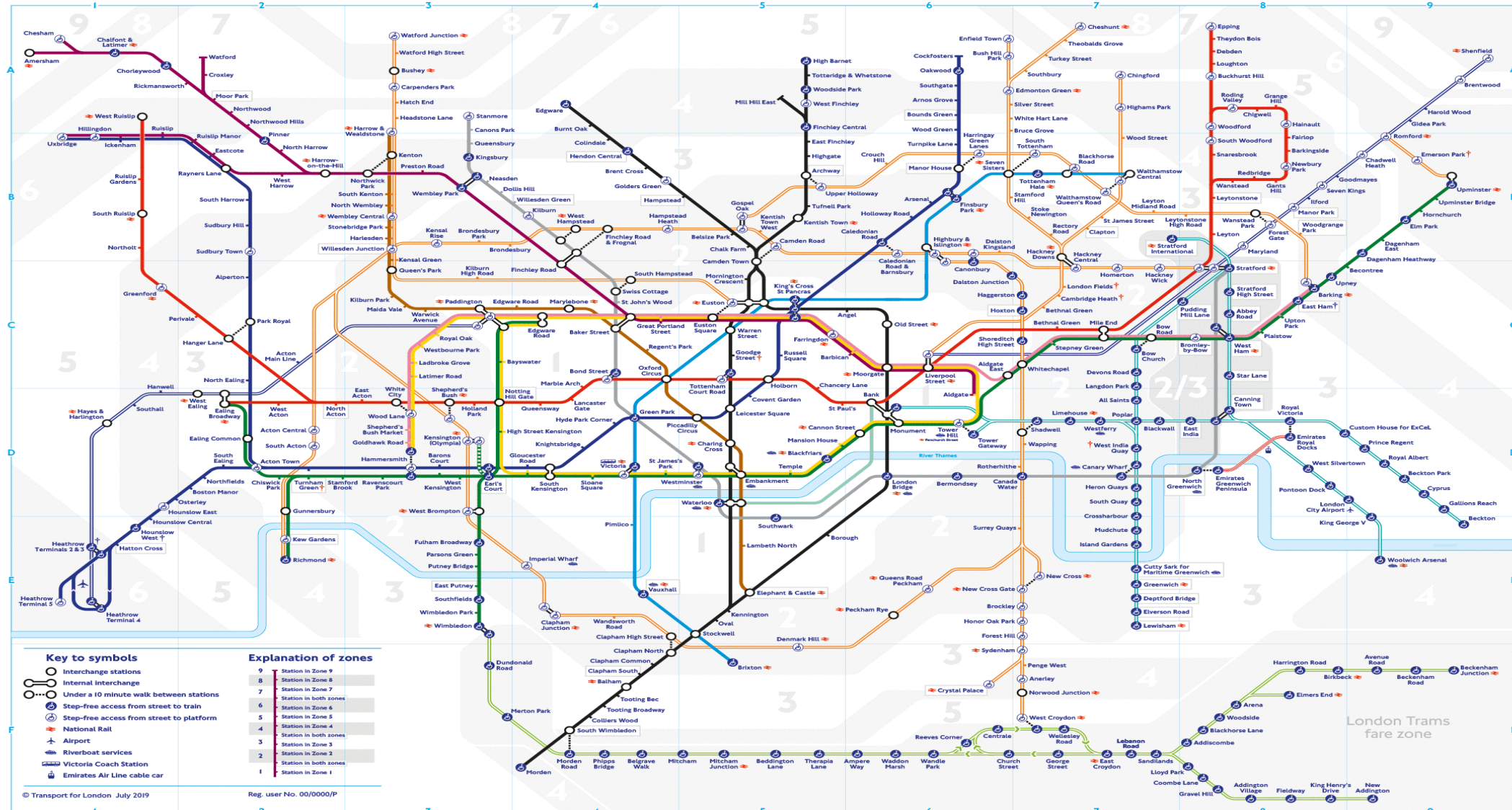
Getting rid of your car can reduce 2.5 tons of CO<sub>2</sub> – about one-fourth of the average yearly emissions (9.2 tons) contributed by each person in developed countries of the Organization for Economic Co-operation and Development (OECD).

# Can You Live Without a Car? – Cost Savings, Benefits & Alternatives

If you live in one of the larger U.S. cities, you may get by without a car, but it will be difficult. Even in the best cases, public transport is mediocre compared to any European city.



# Tube map



**Check before you travel**

- † East Ham  
No step-free access to the eastbound District line from Tuesday 23 July 2019 until early January 2020.
- † Heathrow  
TFL Rail customers should change at Terminals 2 & 3 for free rail transfer to Terminal 5.
- † Hounslow West  
Step-free access for manual wheelchairs only.
- † Services or access at these stations are subject to variation. To check before you travel, visit [tfl.gov.uk/plan-a-journey](http://tfl.gov.uk/plan-a-journey)

- Key to lines**
- Bakerloo
  - Central
  - Circle
  - District
  - Hammersmith & City
  - Jubilee
  - Metropolitan
  - Northern
  - Piccadilly
  - Victoria
  - Waterloo & City
  - DLR
  - Emirates Air Line cable car (special fare apply)
  - London Overground
  - TFL Rail
  - London Trams
  - District open weekends and on some public holidays

- Key to symbols**
- Interchange stations
  - Internal interchange
  - Under a 10 minute walk between stations
  - Step-free access from street to train
  - Step-free access from street to platform
  - National Rail
  - Airport
  - Riverboat services
  - Victoria Coach Station
  - Emirates Air Line cable car

- Explanation of zones**
- 9 Station in Zone 9
  - 8 Station in Zone 8
  - 7 Station in Zone 7
  - 6 Station in both zones
  - 5 Station in Zone 5
  - 4 Station in Zone 4
  - 3 Station in both zones
  - 2 Station in Zone 2
  - 1 Station in both zones

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And if you want to travel short hops outside of American cities.



# Other Steps?



## **Paint your roof white:**

During summer heat waves, when the sun beats down from unclouded skies, the creation of lighter land surfaces “could help to lower extreme temperatures... by up to 2 or 3 degrees Celsius” in much of Europe, North America, and Asia, says Sonia Seneviratne, Swiss Federal Institute of Technology. It could save lives, she argues, and the hotter it becomes, the stronger the effect.



# PLANT TREES

- ▶ Researchers at ETH Zurich say that if we plant as many trees as we have room for — “Once mature, these new forests could store 205 billion tons of carbon: about two-thirds of the 300 billion tons of carbon that has been released into the atmosphere as a result of human activity since the Industrial Revolution.”



But bear in mind that there are 3  
Trillion trees in the world



But none of the steps we take on an individual level, even if everybody did them, will be sufficient to prevent serious consequences



So why do them?

▶ Because it feels  
good.

# SO, WHAT TO DO?

## 1. Suggestions; **green new deal**

A combination of mitigating carbon pollution and reinforcing and rebuilding infrastructure

All proposals for confronting the problem are some cocktail of these ideas. None is sufficient.

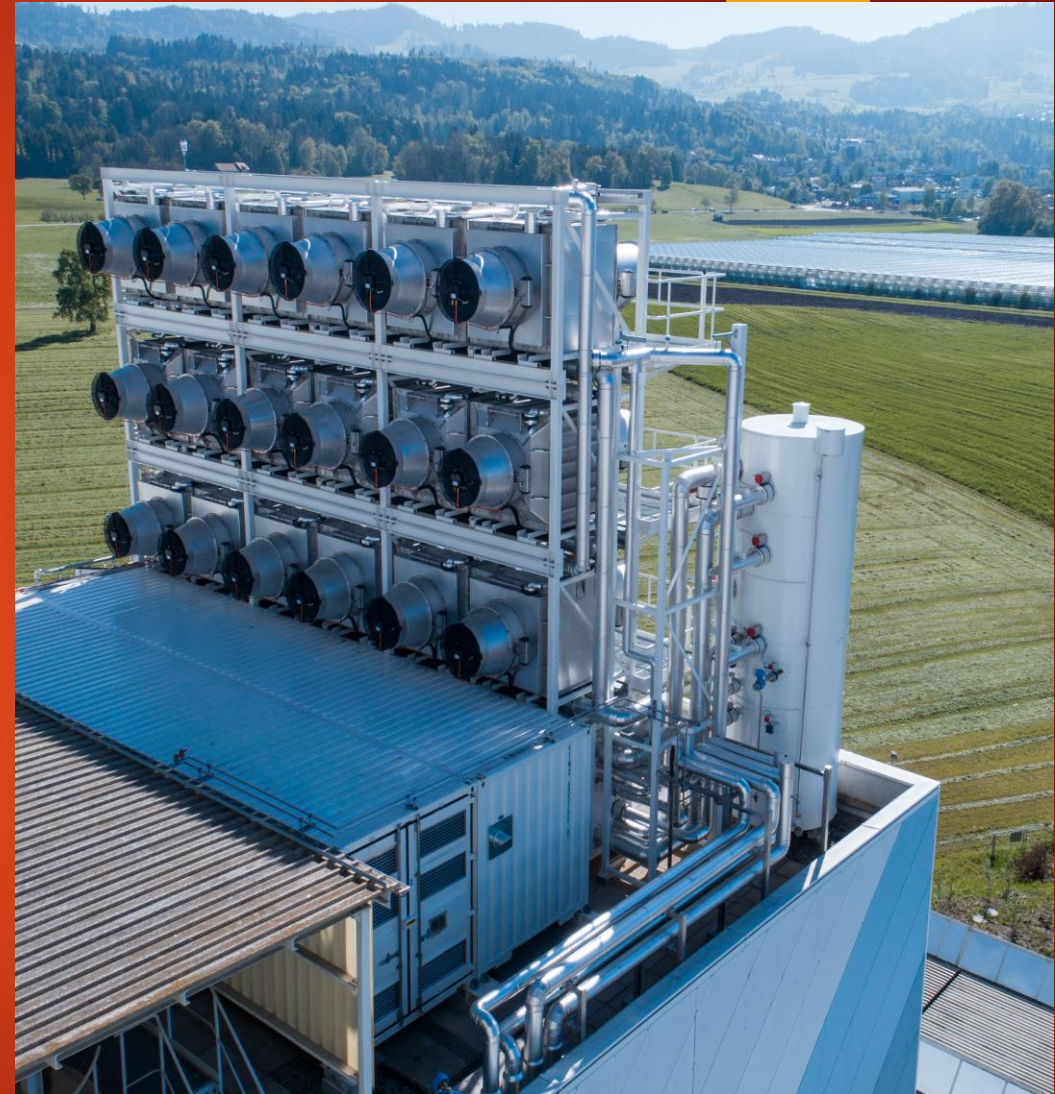
## 2. **climate Engineering**

Argues that the green new deal would be impossible to effect world wide, therefore Remove CO<sub>2</sub> and other greenhouse gases from atmosphere **OR**

Prevent solar heating by blocking or reflecting sunlight

# Large Scale Intervention to Reverse Climate Change

- ▶ **Geoengineering** is large-scale intervention in the Earth system to counteract human-induced climate change. There are **two** main types of **geoengineering approaches**: Carbon dioxide removal (CDR) AND
- ▶ Solar radiation management (SRM).



# Climate Engineering ?

- ▶ **Al Gore said “it would be insane, utterly mad and delusional in the extreme” to turn to geo-engineering projects to avoid a climate catastrophe.**

# Only feasible solution, scientifically, economically and politically

- ▶ Recently, Hansen and colleagues stated that continued opposition to nuclear power threatens humanity's ability to avoid dangerous climate change.
- ▶ The best candidate to avoid that is nuclear power. It's ready now. We need to take advantage of it." and "Continued opposition to nuclear power threatens humanity's ability to avoid dangerous climate change."
- ▶ 'Miniature', Modular Nuclear Power Plants Could Be Rolled Out in The US The future of nuclear power might look very different than we thought, with a US-based company presenting plans for miniature, modular nuclear power plants that are so small, they can fit on the back of a truck.



# Bottom Line

- ▶ Lots of ideas, lots of argument, lots of possibilities little agreement.
- ▶ Progress is way too slow, even in countries where there is agreement on the seriousness of the problem (EU; Germany prime example).



But Nothing will happen unless the public demands it



Questions?

