The background features several circular gauges and arrows, suggesting a technical or scientific theme. The gauges have numerical scales, with one prominent gauge on the left showing values from 140 to 260. The overall color palette is a gradient of dark blue and purple.

# A ROAD MAP FOR LIVING IN THE ERA OF GLOBAL WARMING

## SESSION II

LARRY R. CHURCHILL, PHD  
VANDERBILT OLLI, WINTER, 2023  
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# LEFTOVERS

## *QUESTIONS/COMMENTS FROM SESSION 1*

- Impact of global warming on other species
- Disinformation campaigns
- Carbon footprint of Amazon

# SPECIES AND EXTINCTION

- There are over a million species of plants, animals and other life forms on Earth
- 200 go extinct every day =73,000 every year, and pace is accelerating

Causes:

Destruction of habitats, overfishing, overhunting

Ocean acidification and the resulting dead zones (25% of all CO<sub>2</sub> is absorbed by the oceans)

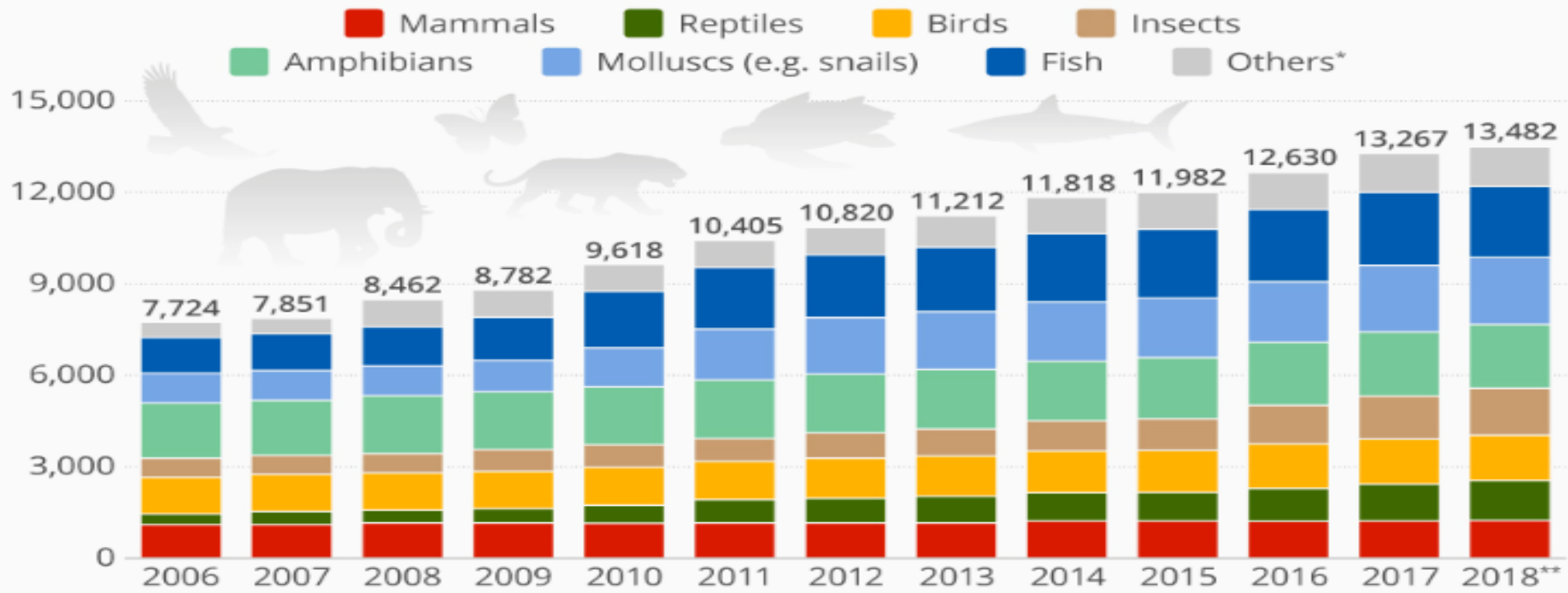
Droughts, floods, fires and loss of arable land

# IMPACT OF CLIMATE CHANGE ON OTHER SPECIES

## LOSS OF BIODIVERSITY

### The Number of Threatened Species is Rising

Number of animal species of the IUCN Red List, by class



\* other invertebrate (spineless) animals, such as crustaceans, corals and arachnids (spiders, scorpions)

\*\* Red Lists published in July



# WHY IS BIODIVERSITY IMPORTANT?

1. Balance in ecosystems needed for survival
  - Flourishing of humans emerged from the extraordinary biodiversity of the past geological eras
2. Food chains
  - Decline in bee populations and other pollinators
3. Loss of livelihood
  - fisherman and fishing industry

# DISINFORMATION CAMPAIGNS

Why don't we just call these lies? (The moral evil of lies is deliberate efforts to deceive and mislead)

Texas Public Policy Foundation (non-profit based in Austin)

- Funded by Exxon, Chevron and Peabody Energy
- Works to keep coal-fired plants open
- Filed suit to block first Massachusetts wind farm; sued the EPA
- Spreads misinformation about climate science; has powerful state and national lobbying arms
- Promotes idea that U.S. prosperity is inextricably linked to oil, gas and coal -- "I'm thankful to enjoy a high-carbon lifestyle"
- Funded campaigns of Governors Rick Perry and Greg Abbott. Abbott signed law that prohibits businesses that divest from gas and oil from doing business with the state of Texas

# AMAZON'S CARBON FOOTPRINT

## Customer habits that increase carbon footprint

- Ordering one item at a time
- Using next-day delivery via Amazon Prime

## Amazon management

- Pledge to go net zero by 2040
- Switch to Electric Vehicles (EVs): 1,800 new EVs from Mercedes-Benz for European operations; 100,000 new EVs from Rivian, by 2030.

# HOW WE GOT HERE: SOME EVENTS AND DATES

- 1895– Swedish scientist Svante Arrhenius demonstrated the relationship between carbon dioxide levels and atmospheric temperatures and said widespread burning of coal increases global temperatures
- 1988—James Hansen, Director of NASA testified before the U.S. senate that it was 99% certain that variations in temperature were not naturally occurring but are a manmade buildup of greenhouse gases (GHG)
- 1988 – UN Intergovernmental Panel on Climate Change (IPCC) created; UN Framework Convention on Climate Change formed
- There have been COP (UN “Congress of the Parties”) meetings since 1995
- 2006– “An Inconvenient Truth” featuring Al Gore’s lecture on global warming
- 2022 – federal legislation (Inflation Reduction Act) to kick-start renewable energy development



# WHY WERE WE ASLEEP AT THE WHEEL?

1. It is an inconvenient truth; carbon burning is tied up with the American consumptive lifestyle
2. Political power of big oil and gas (\$45 million lobbying in 2022)
3. Limiting energy is in direct conflict with capitalism, which requires growth in energy production, until green energy becomes the main source
4. Tempering of IPCC reports for political reasons

# WHY ARE WE STILL DOING TOO LITTLE ?

1. Short Horizon Thinking
2. Political Incompetence
3. Humans as the Crowning Endpoint of Evolution
4. Consumerism as the Dominant Measure of Well-Being
5. Fantasies of Rescue: Theological and Technological

adapted from L. R. Churchill, *Ethics for Everyone* (Oxford, 2020)

# A SAMPLING OF RESPONSES TO OUR CRISIS

- Denial and Skepticism
- Doomsdayism, and Making Adaptations for doomsday
- Protests and Demonstrations
- Assigning Blame
- Technical Innovations and their Promise
- Long-range Cultural Adaptations -- Session III and following

# DENIAL AND SKEPTICISM

- A. Denial because the news is too big to take in, e.g., selective focus on skeptical reports, rather than the science
- B. Denial because the news is too damaging to one's core beliefs, e.g. heliocentrism, evolution, the Holocaust, ranking of U.S. healthcare system....
- C. Denial based in conspiracy theory, e.g., climate action as threat to freedom, plot to take away our cars; or more evidence of a deep state controlled by pedophiles, etc.
- D. Some combination of the above

← Skepticism-- frequently combined with 'Greenwashing' e.g., cautions about "catastrophic thinking", things won't be so bad, oil and gas are a necessary bridge to the future



# SKEPTICISM & DENIAL IN SCIENCE

## DISINFORMATION CAMPAIGNS

- Skepticism: the foundation of the scientific method, demanding evidence, withholding conclusions until evidence is compelling . . .
- Denial: failure to accredit the evidence, not accepting evidence, science compromised
- Disinformation Campaign: decades long campaign of Exxon-Mobil, Koch brothers and others to suppress the evidence of their own scientists, and promote bogus research, lobbying through American Petroleum Institute

Since 2015, 98% of scientists world-wide have concluded that human causes of climate change are as well-founded as the fact that cigarette smoking causes cancer and heart disease

## DOOMSDAYISM AND APOCALYPTIC THINKING IN WESTERN CULTURE

- Apocalypse comes from Greek word meaning “unveiling” or “revelation”
- The complete and final destruction of the world as it exists
- The final battle between God and forces of evil
- Justice and Truth at the end of history
- The righteous and faithful prevail





# DOOMSDAY, POST- APOCALYPSE



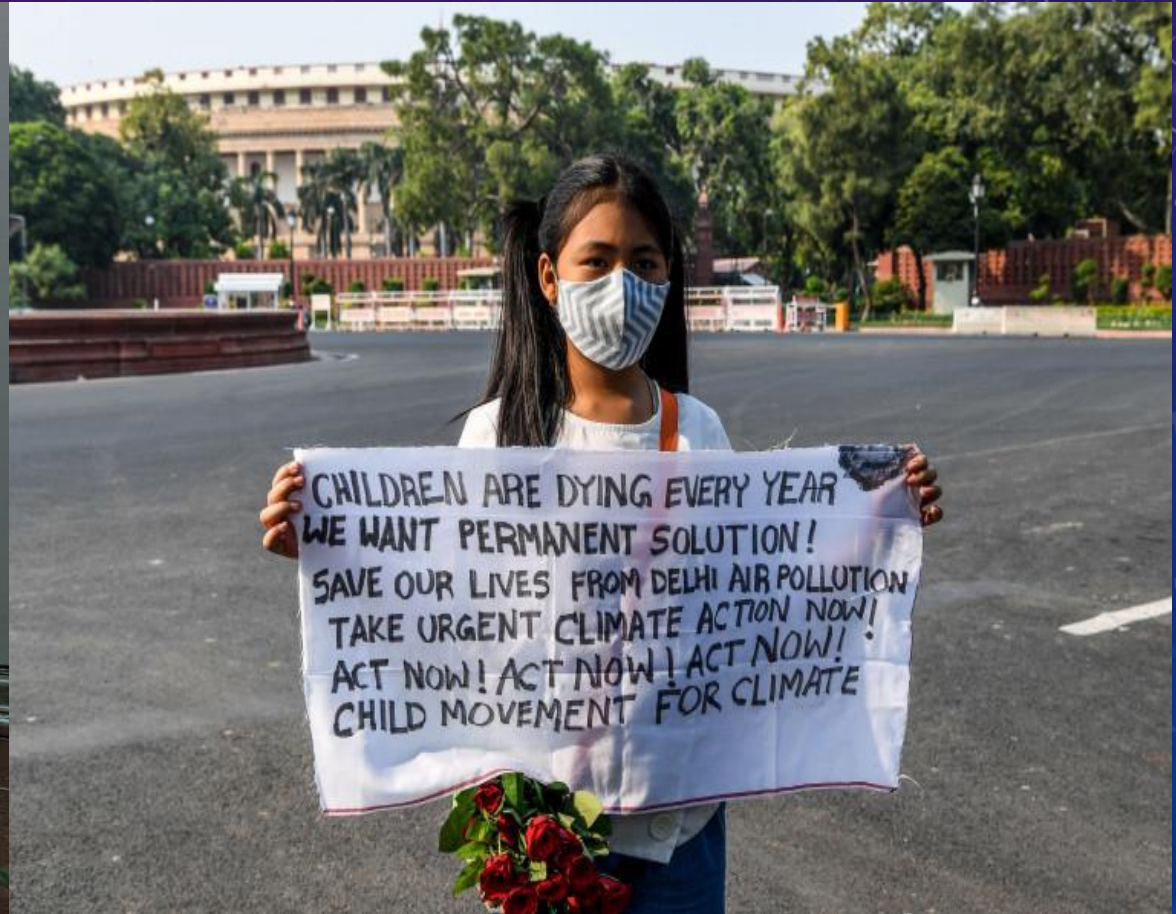


# DOOMSDAY BUNKERS, BUT ONLY FOR BILLIONAIRES





# PROTESTS AND DEMONSTRATIONS





# PROTESTS AND DEMONSTRATIONS



# PROTESTORS ARE *YOUNG*

- “You are failing us. But the young people are starting to understand your betrayal. The eyes of all future generations are upon you. . . The world is waking up. And change is coming, whether you like it or not.”
- – *At the UN Climate Action Summit on September 23, 2019.*





# THE DILEMMA OF CLIMATE ACTIVISTS

How to be effective without turning the public against you?

How to get the public's attention without alienating them?

How, what and who to target in protests?

- Gas stoves, gas leaf blowers
- Supporting a big carbon tax—not popular, adds to existing hardship and middle class anxiety in absence of cheap, efficient EVs with a longer driving range; the same for electricity use powered by oil, gas or coal
- Why art?
- Blowing up gas and oil pipelines? So far protests have been almost completely non-violent
- What forms of protest are most effective? Is violent protest inevitable?



# ASSIGNING BLAME -- BIG OIL AND GAS



# ASSIGNING BLAME --- MOST OR ALL OF US





# PROBLEMS WITH EATING BEEF

- Producing beef is 100 times as land intensive as cultivating potatoes
- Livestock use 80% of all arable land, but produce only 20% of needed calories
- Americans average 3 burgers a week
- Livestock are a substantial producer of methane gas, which is 80+ times more toxic to the environment than carbon dioxide
- Cattle farming is the No. 1 reason for clearing the Amazon rain forests

# ASSIGNING BLAME -- BIGGEST POLLUTERS

Country	CO2 emissions 2019 (metric tons)	CO2 per capita 2019 (metric tons)
China	9,876.50	7.1
United States	4,744.50	14.4
India	2,310	1.7
Russia	1,640.30	11.4

China, the European Union and the United States contribute 41.5% of total global emissions



ONE METRIC TON = GAS THAT WOULD FILL SPHERE  
32FT. IN DIAMETER



## ASSIGNING BLAME -- BIGGEST POLLUTERS BY CLASS

From 1900 to 2020 the world's richest 10% were responsible for 52% of cumulative carbon emissions, while the world's poorest 10% were responsible for only 7% of total carbon emissions

source: OXFAM

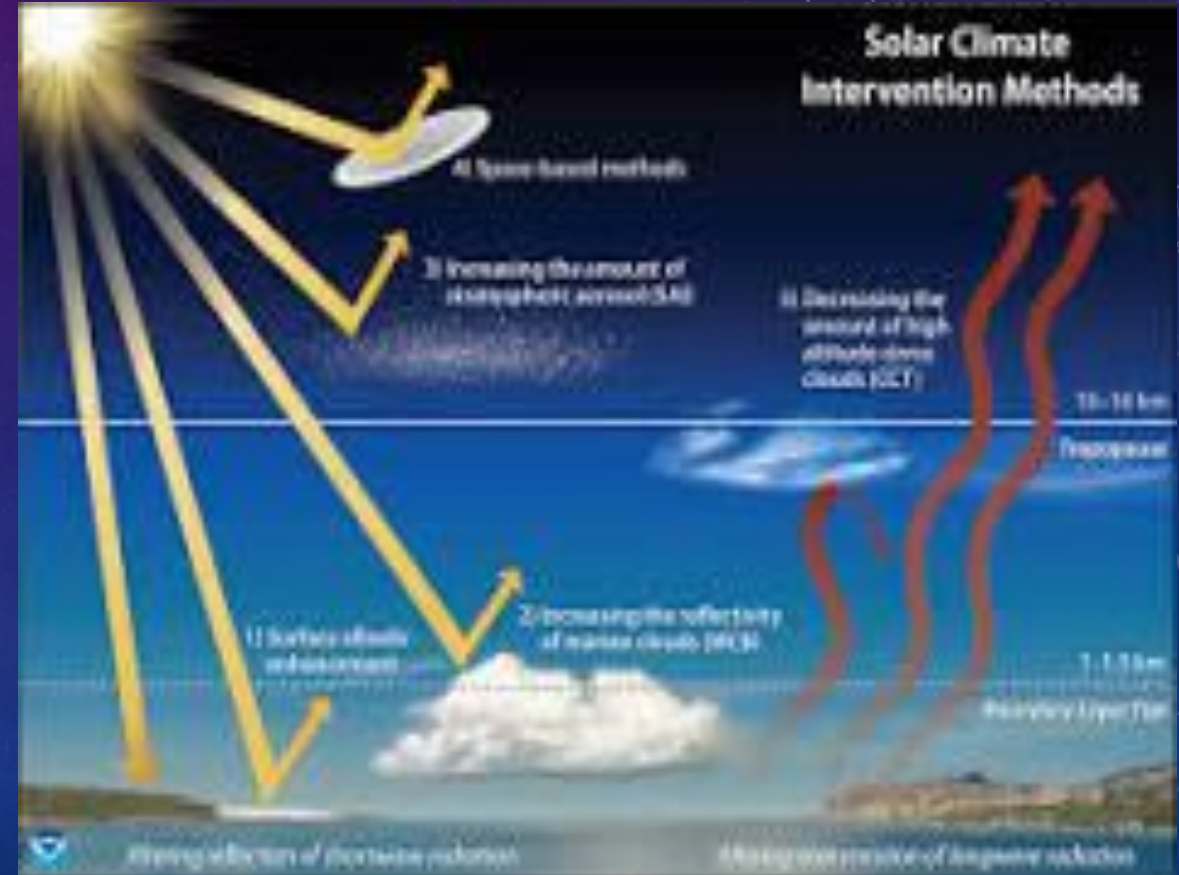
# REDUCING THE SIZE OF THE CARBON FOOTPRINT

To keep global temperatures at 1.5 C or lower, the average carbon footprint for an individual should be 1.8 metric tons per year

- U. S. average is 14.4 metric tons
- China's average is 7.1 metric tons
- LRC = 7.6; could get to 5.7 with more consistent effort



# ENERGY TECHNOLOGIES AND CLIMATE GEOENGINEERING FROM THE FEASIBLE TO THE IMPROBABLE & HAZARDOUS



# WIND AND SOLAR ENERGY

DENMARK GENERATES OVER 40% OF ITS ENERGY VIA WIND

CHINA IS THE LEADER IN SOLAR TECHNOLOGY

EFFICIENCY IS INCREASING; PRICES ARE DROPPING





# WILL U.S. COMMUNITIES ACCEPT THE 6,000 WIND FARMS NEEDED?

DAVID GELLES, *NYT*, DECEMBER 31, 2022







# GEOENGINEERING, ONE EXAMPLE

Increasing the earth's reflectivity by shooting sulfur dioxide particles into the stratosphere, blocking sunlight and cooling the earth

- Uneven effects: India cooler and wetter, China hotter
- Unintended and unknowable effects could be disastrous
- More will be needed as more GHGs emitted
- Hazard of seeing it as a solution requiring no reduction in GHG emissions; in 2019 survey 67% of respondents were favorable to geoengineering

WRITE ME WITH QUESTIONS OR COMMENTS

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