The challenges of climate change and overview of climate change science

Professor TL Lewis

Readings

1. Chapter 1: The Social Challenge of Climate Change in *Climate and Society: Transforming the Future* by Robin Leichenko and Karen O'Brien.
2. Chapter 2: Scientific Evidence of Climate Change in *Climate and Society: Transforming the Future* by Robin Leichenko and Karen O'Brien.
3. "What We Know About Climate Change." https://climate.mit.edu/what-we-know-about-climate-change. (MIT Explainer)
4. "IPCC Explainer: The Science of Climate Change." https://eciu.net/analysis/infographics/ipcc-science-of-climate-change. (infographic)

Quiz #0

1. Provide one example of scientific evidence that suggests that climate change is real.

2. According to Leichenko and O'Brien, which of the following is not affected by climate change?

a. manufacturing
b. fisheries
c. agriculture
d. social justice
e. All of the above are affected by climate change

Types of quiz questions

1. Short response (Provide one example of scientific evidence that suggests that climate change is real.)

2. **Multiple choice** (According to Leichenko and O'Brien, which of the following is not affected by climate change?

a. manufacturing
b. fisheries
c. agriculture
d. social justice
e. All of the above are affected by climate change)

3. True/false (The Earth's climate is changing faster today than ever before in the history of our species – and human actions are the main reason why.)

4. Fill in the blank (Which greenhouse gas is the focus of worldwide efforts to get to "net zero" emissions in to reduce global heating?)

Main points

Social challenges of climate change (why care)

- Creates uncertainty
- Affects just about every aspect of our lives
- Knowledge does not necessarily lead to action, but action is needed

Climate change science (how it happens)

- Geological time
- Climate change indicators
- Greenhouse gasses
- Positive and negative feedback loops

Social challenges of climate change - Uncertainty

- New era –
  - the Anthropocene: “an epoch where human activity has been the dominant influence on Earth-system processes” (Leichenko and O’Brien, p.7)
  - the Capitolocene: “Emphasizing global capitalism, unequal power relations, and materialist consumer culture as drivers of environmental degradation…a more appropriate label for the present epoch” Leichenko and O’Brien, p.11)
- Past is not a reliable predictor of the future
- For instance, where to build new roads, homes, bridges etc.
- Creates insecurity – personal and for nations

Social challenges of climate change - Aspects of lives affected

Food, air, water, health

Experiences – fishing, skiing, bird watching, driving/riding subway

Intrinsic value of nature and sense of place

Social and economic systems

Seasonal patterns changed

Social challenges of climate change - Knowledge and action

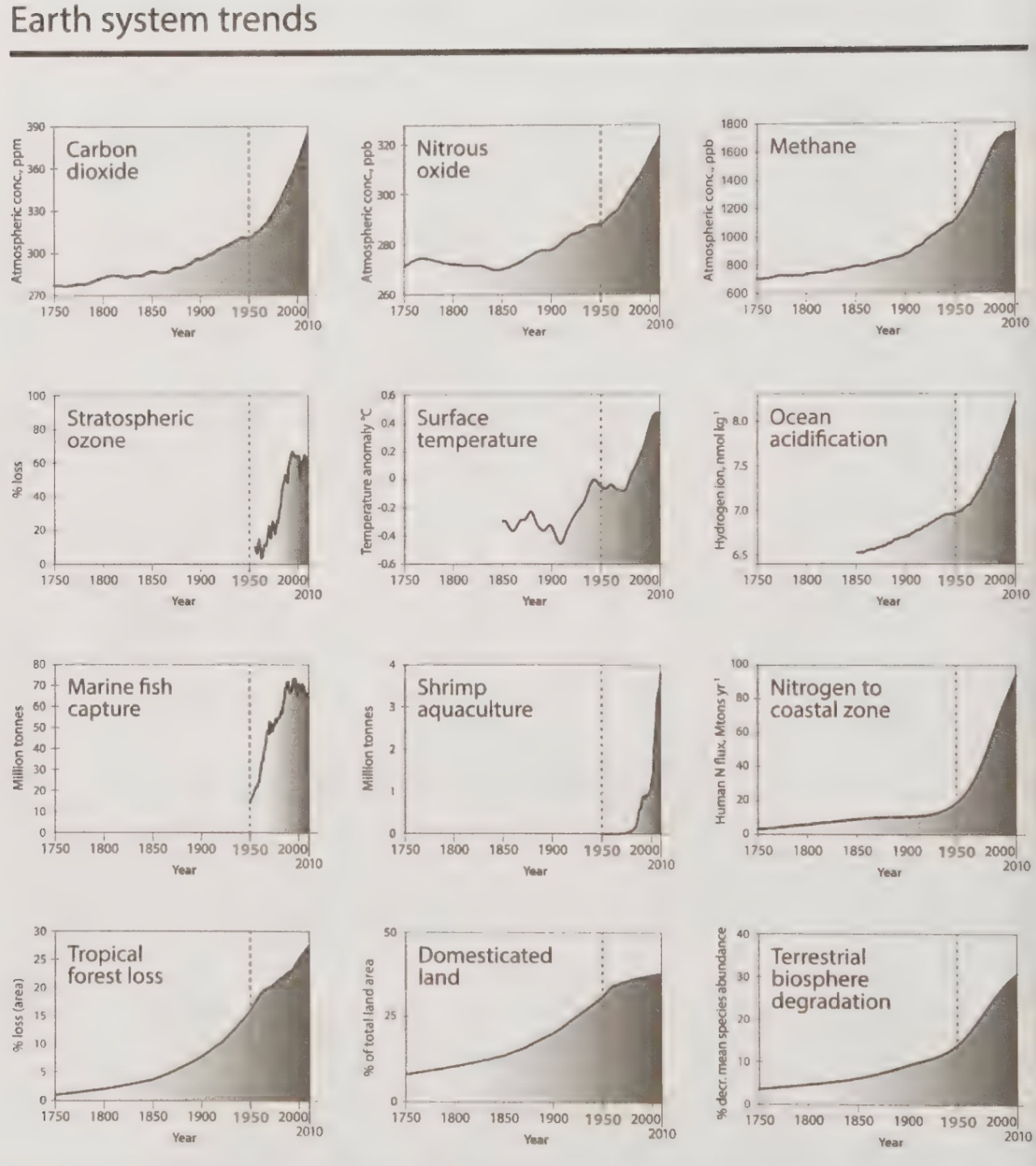
- Climate change is a social issue
  - Inequities among who causes and who is affected by changes;
  - ethical questions: who bears responsibility for the future?
- Knowledge of the problem does not necessarily lead to action
  - The information deficit model does not appear to lead to engagement and action
  - Stories and emotions may better support action
- International Panel on Climate Change (IPCC)
- Paris Agreement – signed in 2015 – aimed at limiting warming to 2 degrees C (and ideally 1.5 degrees C)

Climate change science - Geological time

- Earth: 4.5 billion years old
- Human ancestors: 6 million years old
- Modern humans: 200,000 years old
- Civilization: 6,000 years old
- Last 135 years: global average land and ocean surface temperatures have increase by nearly 1 degree C.

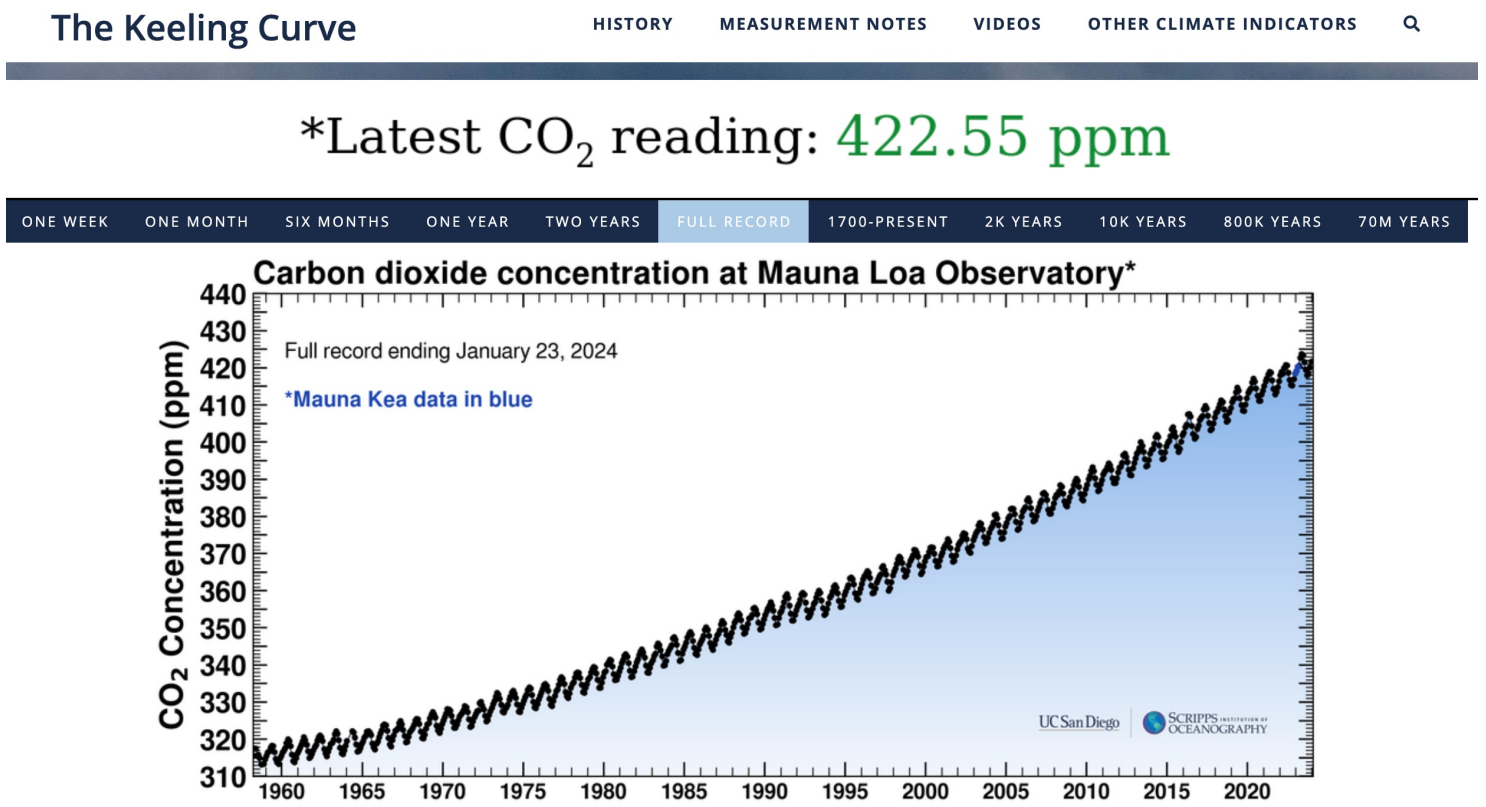
Climate change science - Climate change indicators

- Rising temperatures – ocean and land
- Decreased ice
- Changes in precipitation patterns
- Correlated with increase in fossil fuel burning and other social trends



Climate change science -
Greenhouse gasses

- Greenhouse gasses – Keeling Curve shows an ”unmistakable upward trend” (28)
  - CO2
  - methane
- Carbon budget – 65% of carbon budget has already been used
- Positive feedback loops – melting permafrost



https://keelingcurve.ucsd.edu/

Free write

1. Are there topics that weren’t covered in this summary that you thought were important? What are they?
2. What, if anything, surprised you from the readings?

Additional discussion

What might inspire climate action? Why have/haven’t you acted on the science?

Websites for the challenges of climate change and overview of climate change science

Knowledge and action – inequitable productions of co2 emissions

https://ourworldindata.org/co2-emissions

climate change indicators

https://www.climate.gov/teaching
https://www.epa.gov/climate-indicators/health-society
https://climate.nasa.gov/climate_resources/139/video-global-warming-from-1880-to-2022/
https://climate.nasa.gov/climate_resources/155/video-annual-arctic-sea-ice-minimum-1979-2022-with-area-graph/

greenhouse gasses

https://keelingcurve.ucsd.edu/
https://www.epa.gov/climatechange-science/basics-climate-change – short video