Climate Change and Pennsylvania Past and Present

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Introduction

- Started with the Commonwealth in August 2022
- Previously worked in nonprofit and private industry
- Have two sons
- Leadership on DCNR’s greenhouse gas inventory, climate action plan, and draft environmental justice strategic plan

Pennsylvania Department of Conservation and Natural Resources (DCNR)

Mission: to conserve and sustain Pennsylvania's natural resources for present and future generations' use and enjoyment

124 state parks

2.2 million acres of forest

54 million (2023-24) in grants for local conservation, recreation, and greenways

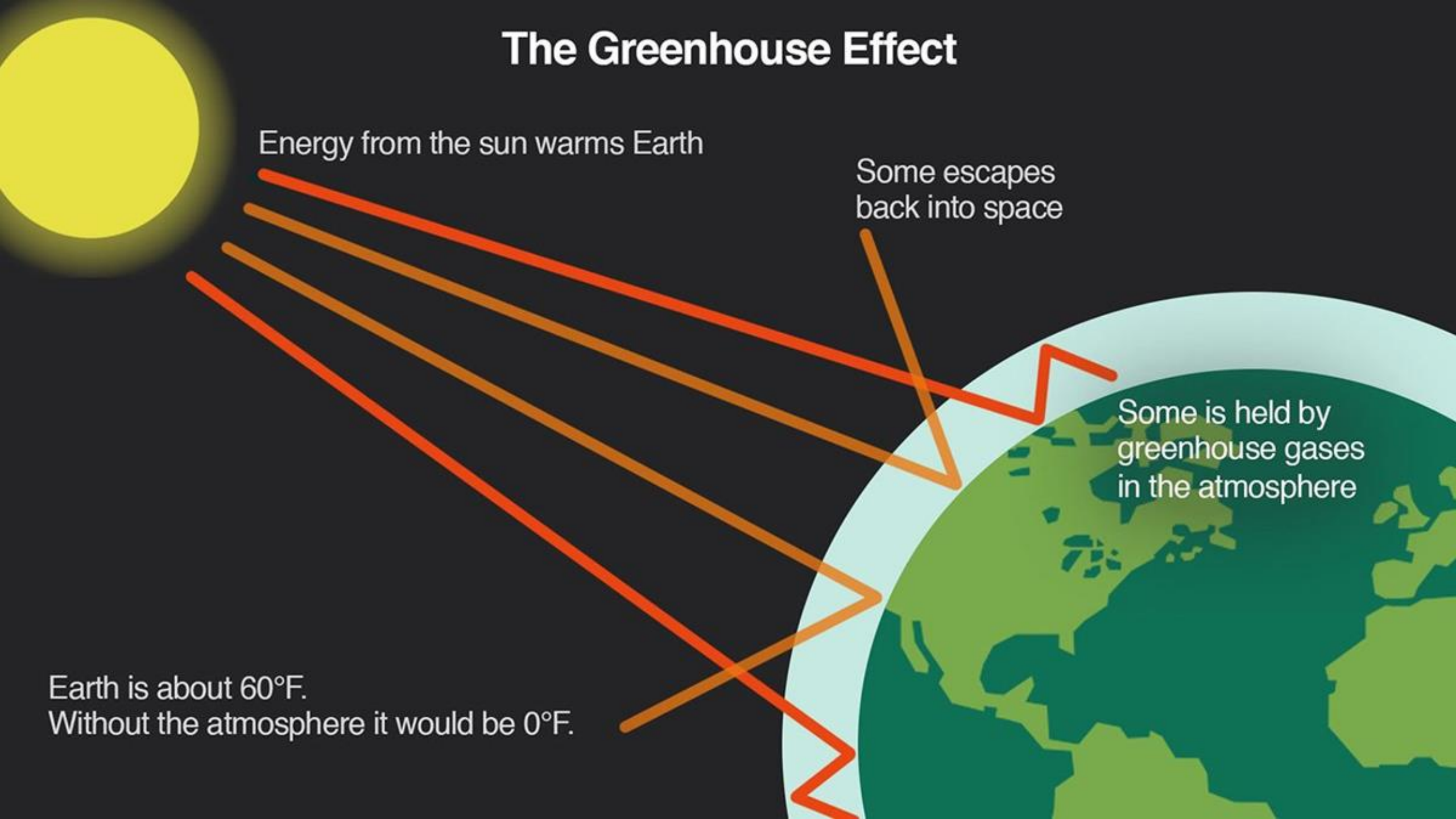
Getting to Know You

Keep Penn's Woods Healthy Presentation - Mentimeter

Humans have had Environmental Impact Throughout History

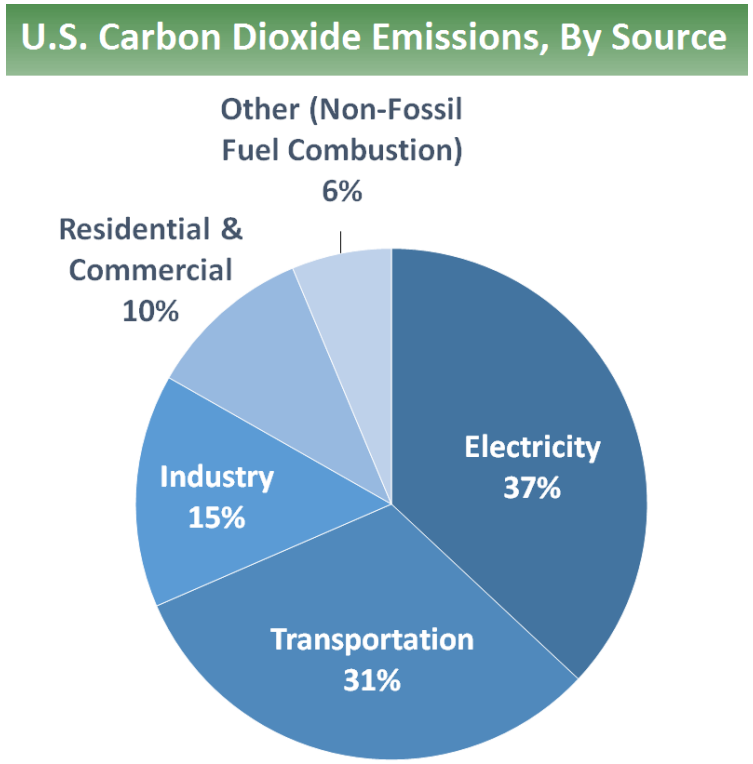
- Industrialization
- Deforestation and land use changes
- Lessons learned have led to positive changes

The Greenhouse Effect

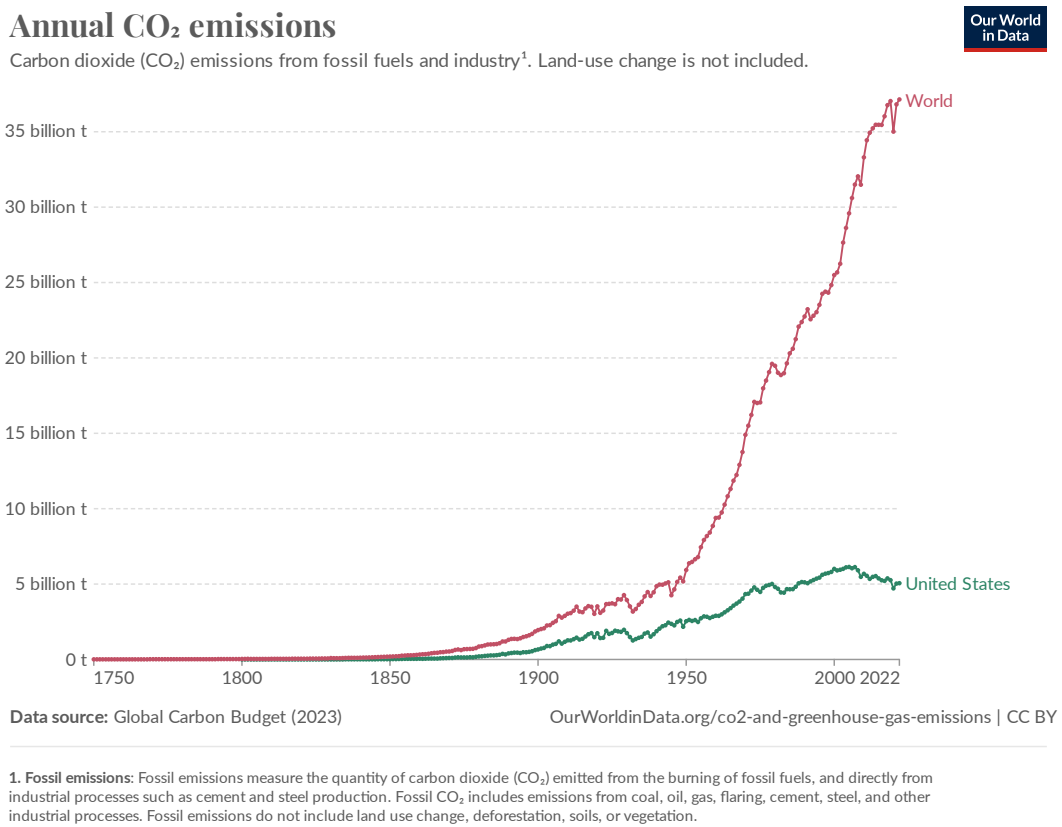


Human Influence on Greenhouse Gas

- CO_2 is emitted largely from the burning of fossil fuels
- Annual CO_2 emissions have increased drastically since 1900s (industrial revolution)



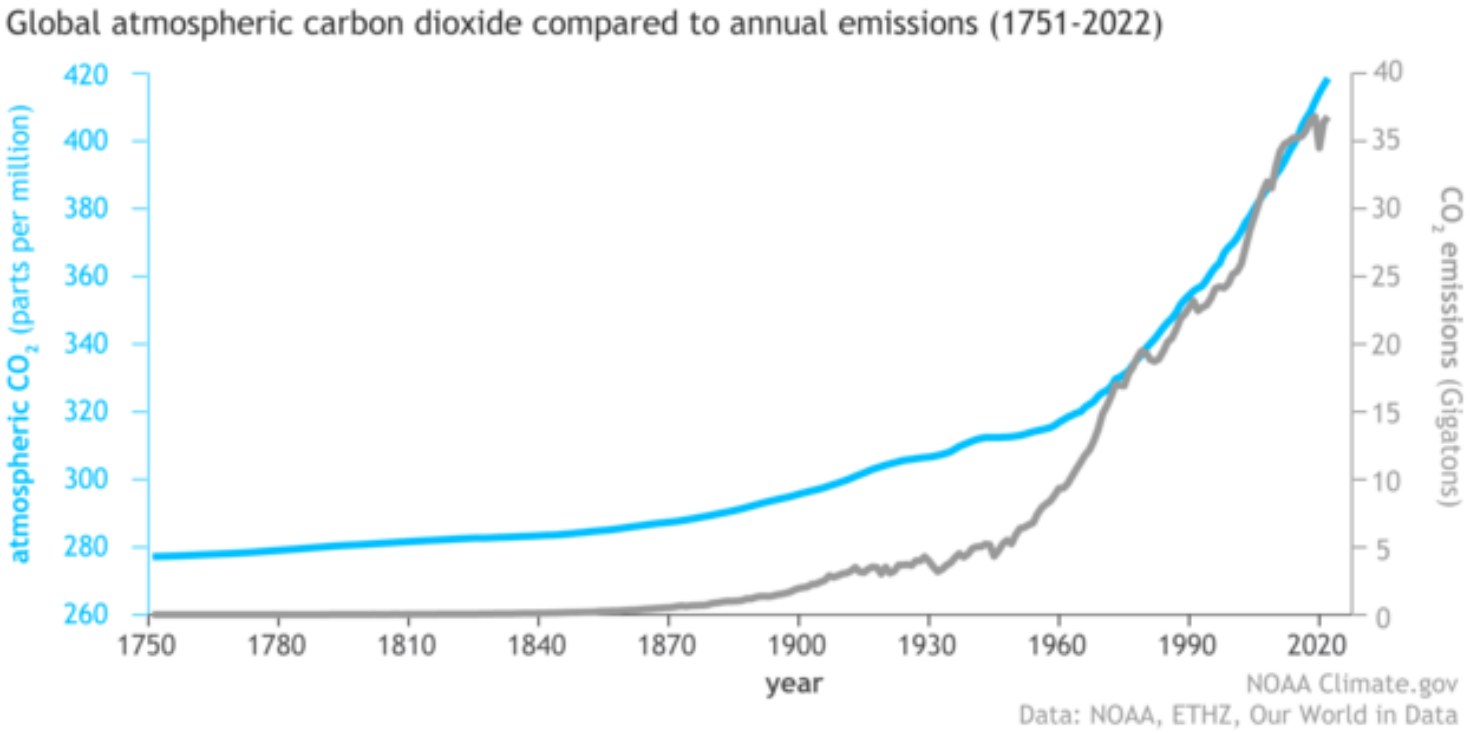
U.S. Environmental Protection Agency (2014).
U.S. Greenhouse Gas Inventory Report: 1990-2014.



1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

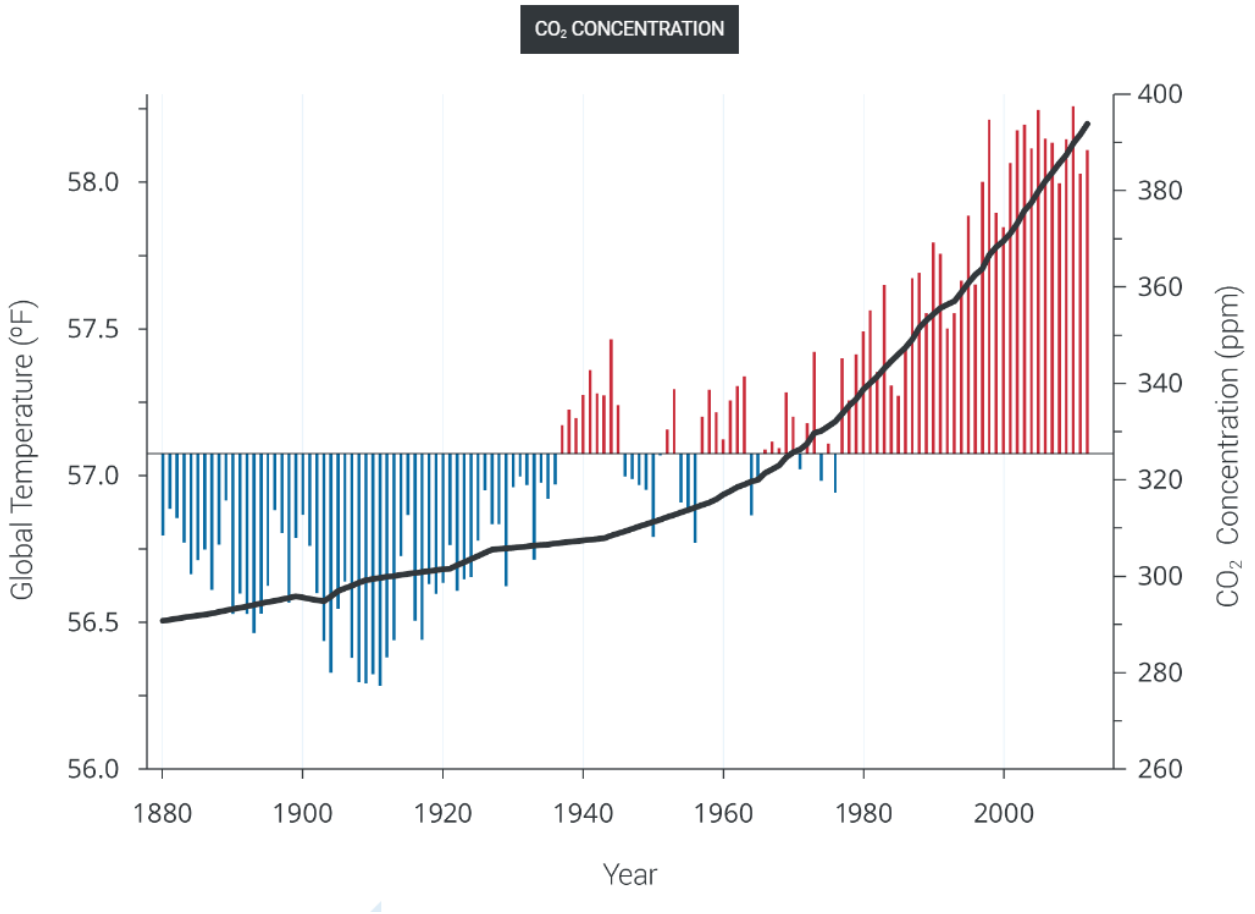
Greenhouse Gas Emissions Impact

Direct correlation between global atmospheric carbon dioxide compared to annual emissions



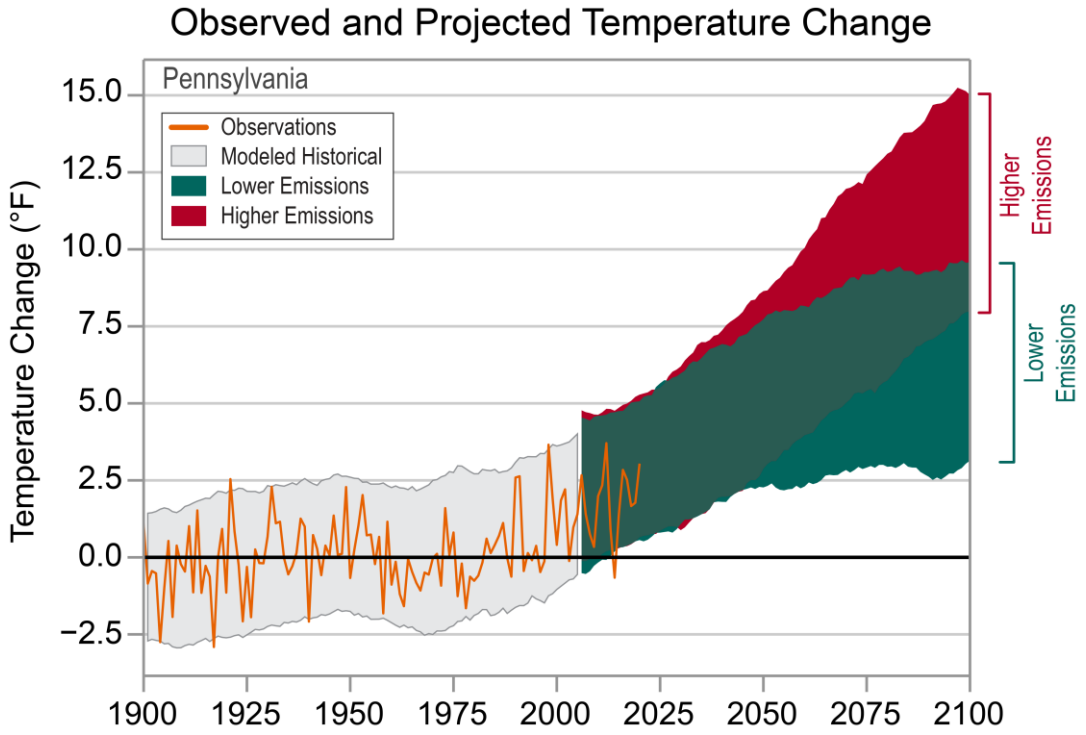
Impact of Rising CO_2 Levels

- Global average surface temperatures have increased drastically in the last 50 years
- 2023 was the warmest year since global records began in 1850 by a wide margin
- The 10 warmest years in the historical record have all occurred in the past decade (2014-2023)



Past, Present, and Future Pennsylvania: **Heat**

- Since the beginning of the 20th century, temperatures in Pennsylvania have risen almost 2°F
- By the end of the decade, the average number of days with a high greater than 90 degrees is predicted to be triple the number from the 1990s.



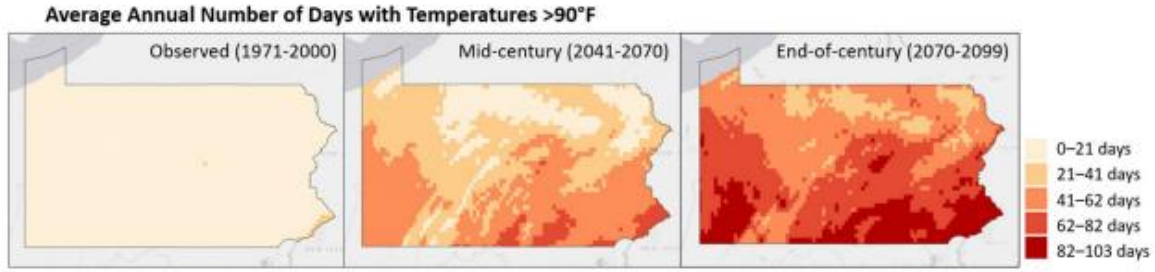
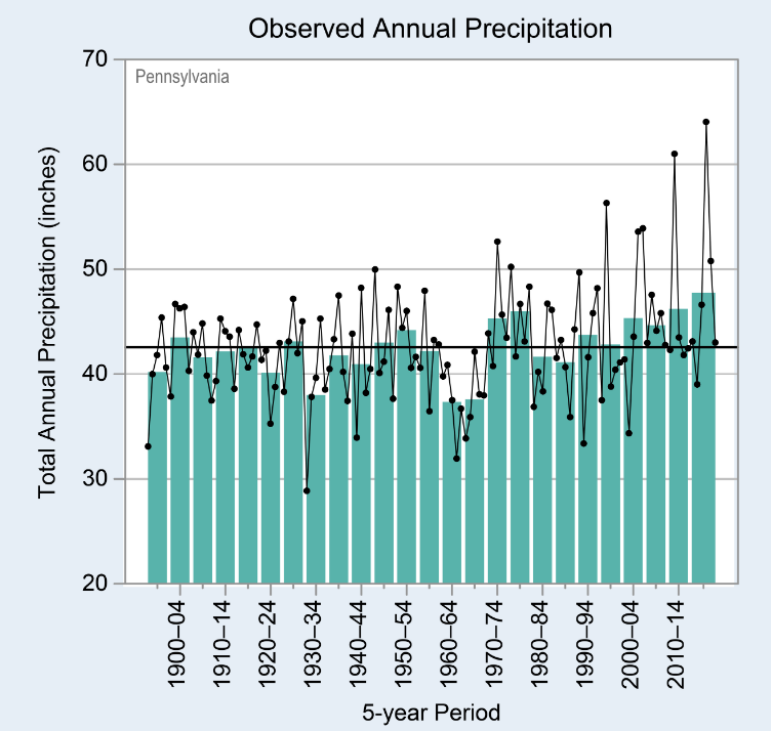


Figure 1. Observed and projected annual days with temperatures above 90°F

Past, Present, and Future Pennsylvania: **Precipitation**

- Between 2000 and 2020, Pennsylvania experienced an increase in annual precipitation of approximately 4.6 inches compared to the 1971–2000
- Snowstorms are projected to decrease in frequency as days below 32 degrees Fahrenheit decrease



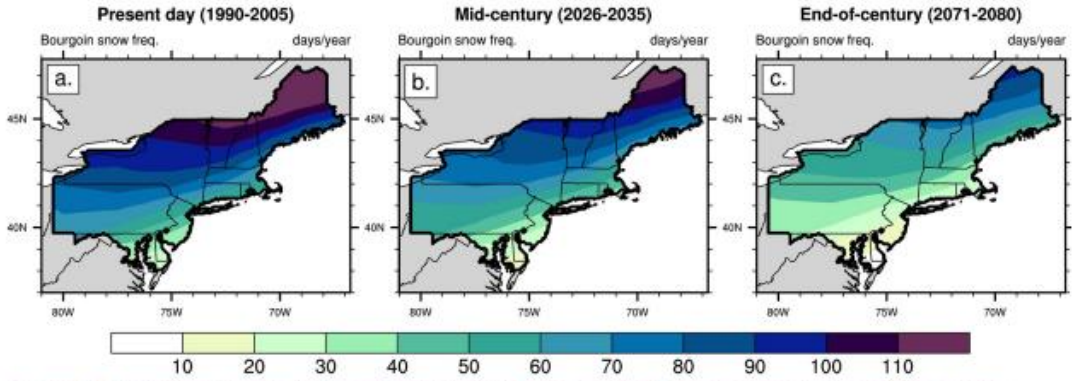


Figure 24. Average number of days per year where snowfall could occur, present-day, mid-century, and end-of-century.

Values for present day represent all years 1990–2005, values for mid-century represent all years 2026–2035, and values for end-of-century represent all years 2071–2080. Source: Zarzycki, C.M., 2018. Projecting changes in societally impactful Northeastern U.S. snowstorms.

Past, Present, and Future Pennsylvania: Extreme Weather

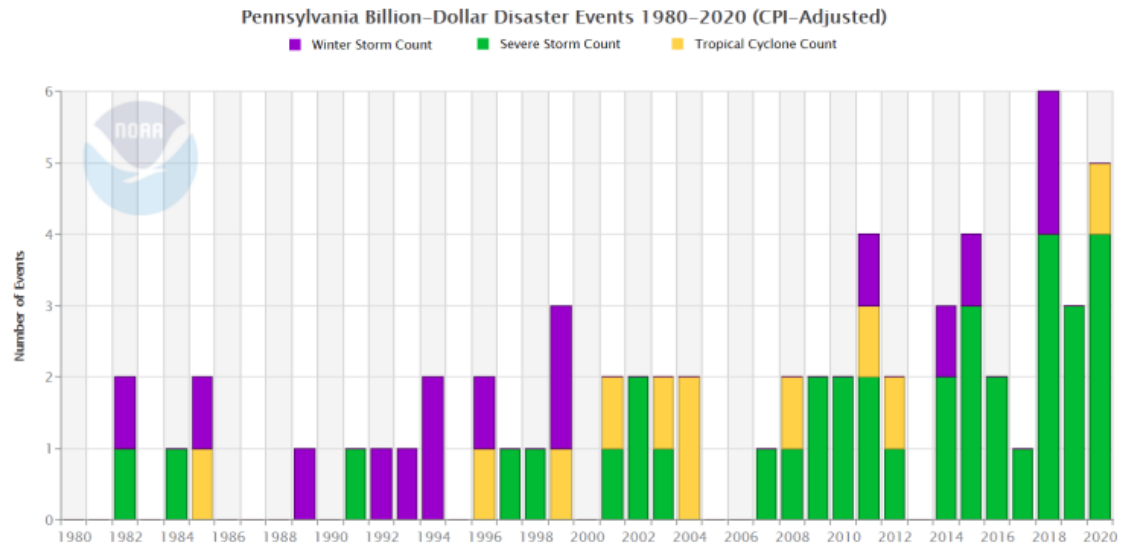


Figure 25. Billion-dollar extreme weather events in Pennsylvania 1980–2020

These events have been adjusted based on the Consumer Price Index (CPI) to 2020 to account for inflation (i.e., events that cost less than a billion dollars at the time of the event, but would cost a billion dollars in 2020 are included). Source: NOAA National Centers for Environmental Information. 2020. Billion-Dollar Weather and Climate Disasters: Time Series. https://www.ncdc.noaa.gov/billions/time-series

- Increasing “Billion-Dollar” events
- Winter weather – in the near term, but long-term will decrease while tropical storms and severe storms will increase

Pennsylvania Future Outlook

- Extreme risk of increased average temperatures and highest total consequences especially to forest, ecosystems and wildlife

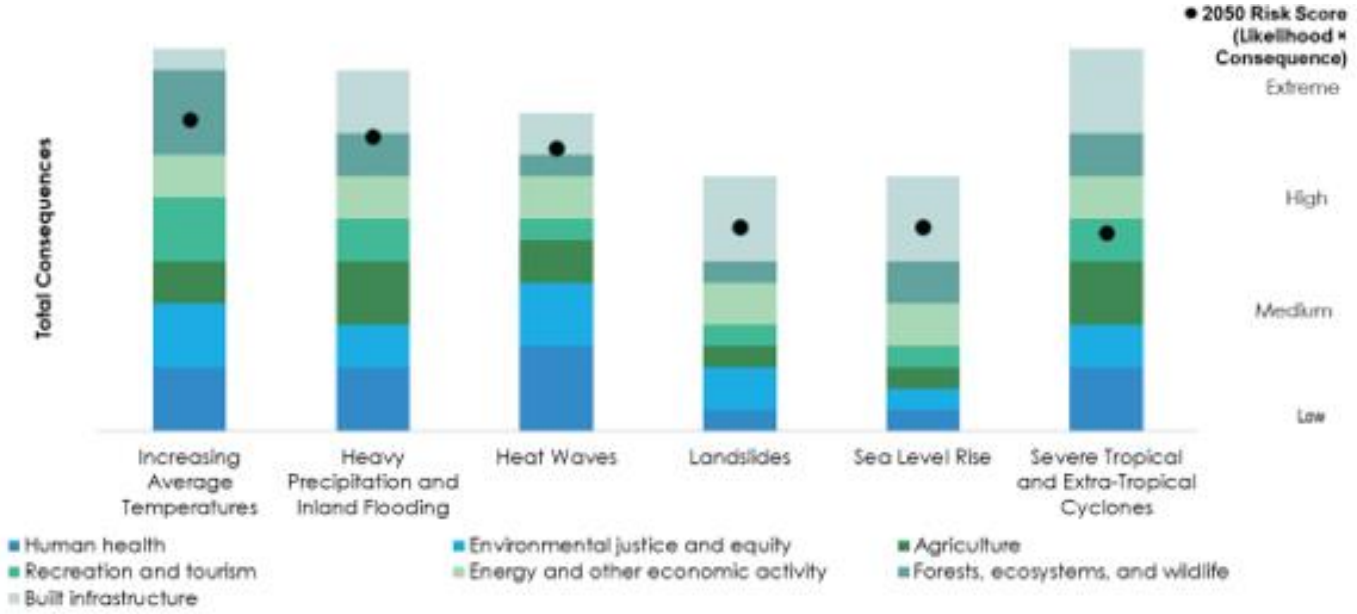
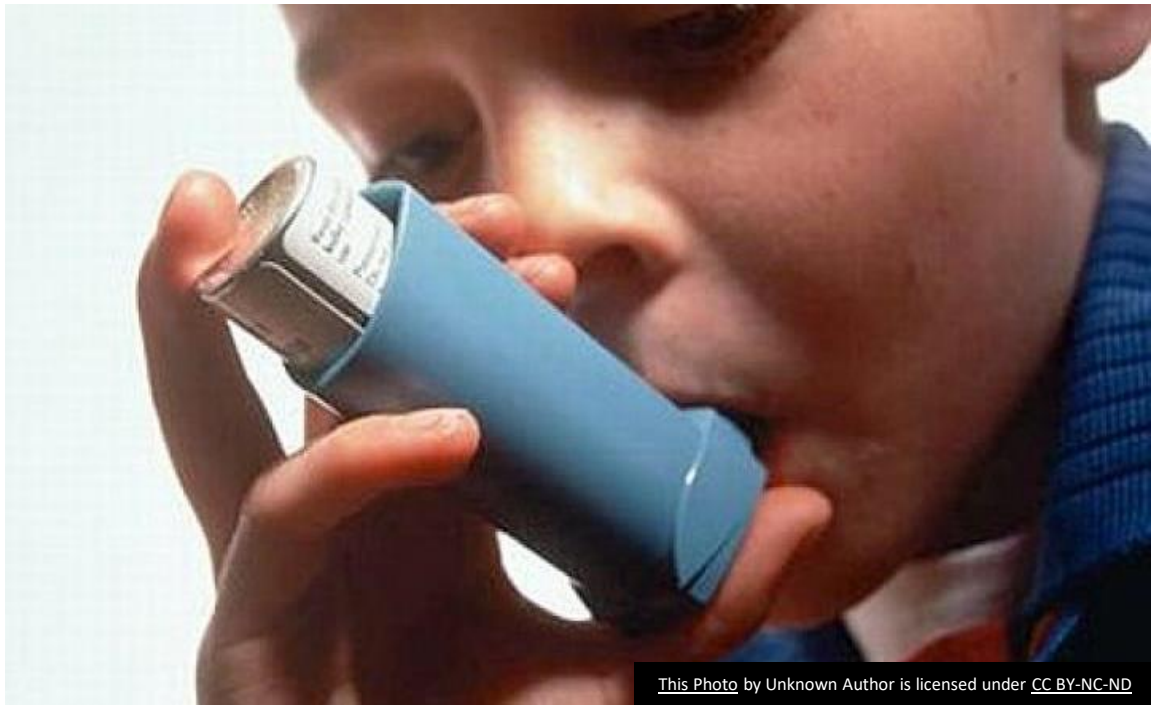


Figure 3. Total consequences by hazard (sorted highest to lowest overall risk)

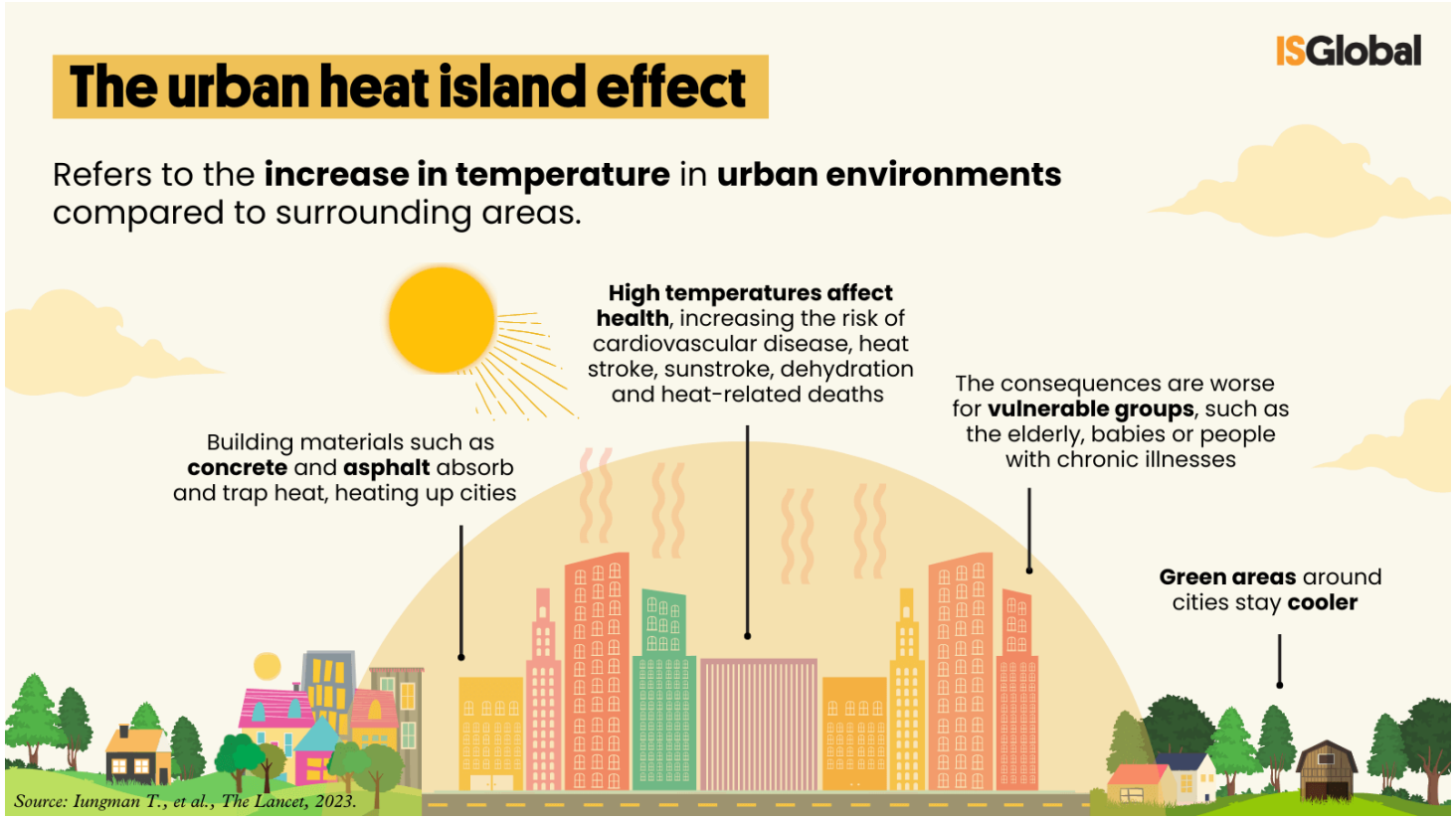
Impacts on Human Health

- Heat-related illnesses
- Respiratory Issues
- Harmful Algal Blooms on Water Bodies
- Vector-Borne Diseases



Impacts on Environmental Justice Communities and Equity

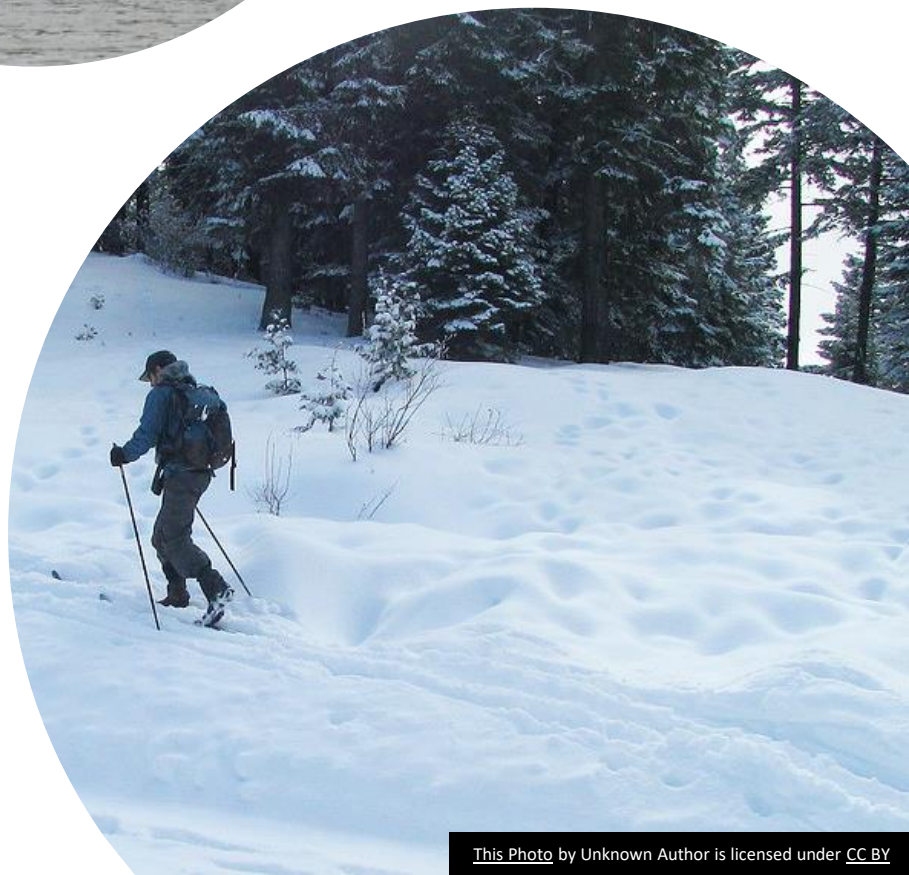
- Disproportionate impacts
- Limited access to resources
- Displacement and relocation



(Fuentes, 2023)

Impacts to Recreation and Tourism

- Altered Seasonal Patterns
- Reduced Snow Cover
- Increase in Water-Based Recreation



Impacts to Forests, Ecosystems, and Wildlife

- Invasive species and pests
- Habitats changing
- Species will adapt, move, or disappear

Seeds of Hope

- Mitigation
- Adaptation
- Partnerships
- Personal Action

DCNR's Climate Action

- DCNR's Climate Adaptation and Mitigation Plan
- Mitigation
  - Greenhouse gas inventory
  - Renewable energy
  - Transportation
  - Forest management practices
- Adaptation
  - Designing infrastructure to changes in the environment
  - Conservation of key locations
  - Investing in communities through grant programs
  - Supporting recreational changes