



Risks Associated with Climate Change

**National Oceanic and
Atmospheric Administration**

March 14, 2024

Dr. Sarah Kapnick
NOAA Chief Scientist

Selected Significant Climate Anomalies and Events: Annual 2023



GLOBAL AVERAGE TEMPERATURE

The Jan–Dec 2023 average global surface temperature was the highest since global records began in 1850.

CANADA

Wildfires across Canada burned more than 45.7 million acres, shattering a record (2.6 times over) for the most acres burned in Canadian and North American history. These fires caused widespread air quality deterioration across much of Canada and the U.S.

NORTH AMERICA

2023 was North America's warmest year on record.

CALIFORNIA

Nine back-to-back atmospheric rivers pummeled California in Jan 2023, which brought a total of 32 trillion gallons of rain and snow to the state.

EASTERN NORTH PACIFIC HURRICANE SEASON

Above-average activity: 17 storms, including 10 hurricanes

HAWAII

On Aug 8, winds from Hurricane Dora exacerbated a wildfire on the island of Maui in Hawaii that destroyed the historic town of Lahaina and became the deadliest wildfire in the U.S. in over a century.

HURRICANE OTIS

On Oct 25, Hurricane Otis made landfall as a Category 5 hurricane near Acapulco on Mexico's southern Pacific coast after increasing wind speed by 115 mph within 24 hours and bringing catastrophic damage to a city of nearly one million people.

ATLANTIC HURRICANE SEASON

Above-average activity: 20 storms, including seven hurricanes

AFRICA

2023 was Africa's warmest year on record.

SOUTH AMERICA

South America had its warmest year on record.

GLOBAL TROPICAL CYCLONES

Above-average activity: 78 storms, including 45 hurricanes/cyclones/typhoons

GLOBAL OCEAN

For nine consecutive months (Apr–Dec), global ocean surface temperatures were record warm.

ANTARCTIC SEA ICE EXTENT

The Antarctic had record-low annual maximum and minimum sea ice extents during 2023.

ARCTIC SEA ICE EXTENT

The 2023 Arctic maximum and minimum extents were third- and sixth-smallest on record, respectively.

EUROPE

Europe had its second-warmest year on record.

CYCLONE DANIEL

On Sep 10, Storm Daniel brought strong winds and an unprecedented amount of rain to eastern Libya, which caused massive destruction—dams burst across many towns and led to the death of more than 10,000 people, making it the deadliest and costliest tropical cyclone of 2023.

NORTH INDIAN OCEAN CYCLONE SEASON

Above-average activity: eight storms, including four cyclones

SOUTH INDIAN OCEAN CYCLONE SEASON*

Above-average activity: nine storms, including seven cyclones

ASIA

2023 was Asia's second-warmest year on record.

TROPICAL CYCLONE MOCHA

Cyclone Mocha was the North Indian Ocean's first named storm of 2023, and made a devastating landfall as a Category 4 cyclone in Myanmar on May 14.

AUSTRALIA CYCLONE SEASON*

Above-average activity: nine storms, including five cyclones

WESTERN NORTH PACIFIC TYPHOON SEASON

Below-average activity: 17 storms, including 12 typhoons

SUPER TYPHOON MAWAR

Super Typhoon Mawar passed within 100 miles of Guam in the Western Pacific on May 24 as a Category 4 storm. Mawar resulted in heavy rainfall and widespread power outages on Guam.

OCEANIA

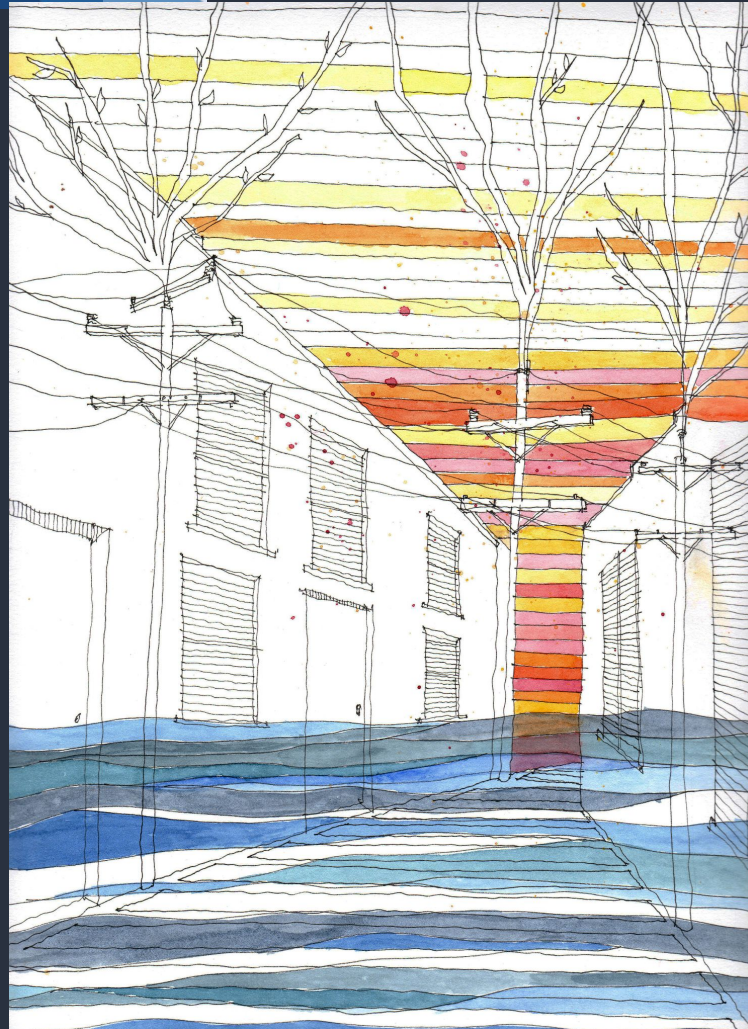
Oceania had its 10th-warmest year on record.

SOUTHWEST PACIFIC CYCLONE SEASON*

Below-average activity: six storms, including three cyclones

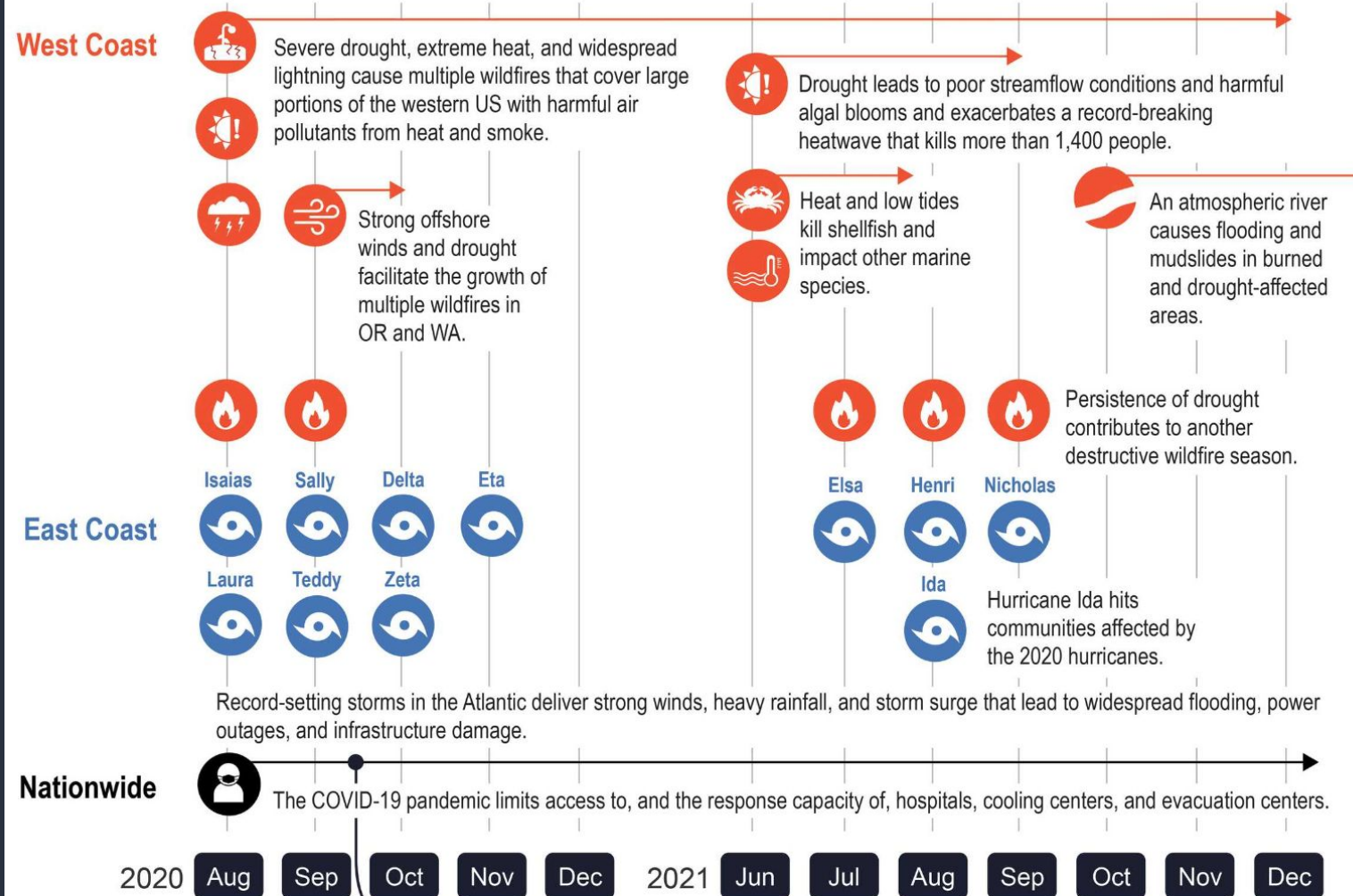
*Cyclone season runs from June 2022–July 2023

Compound risks - more than the sum of their parts



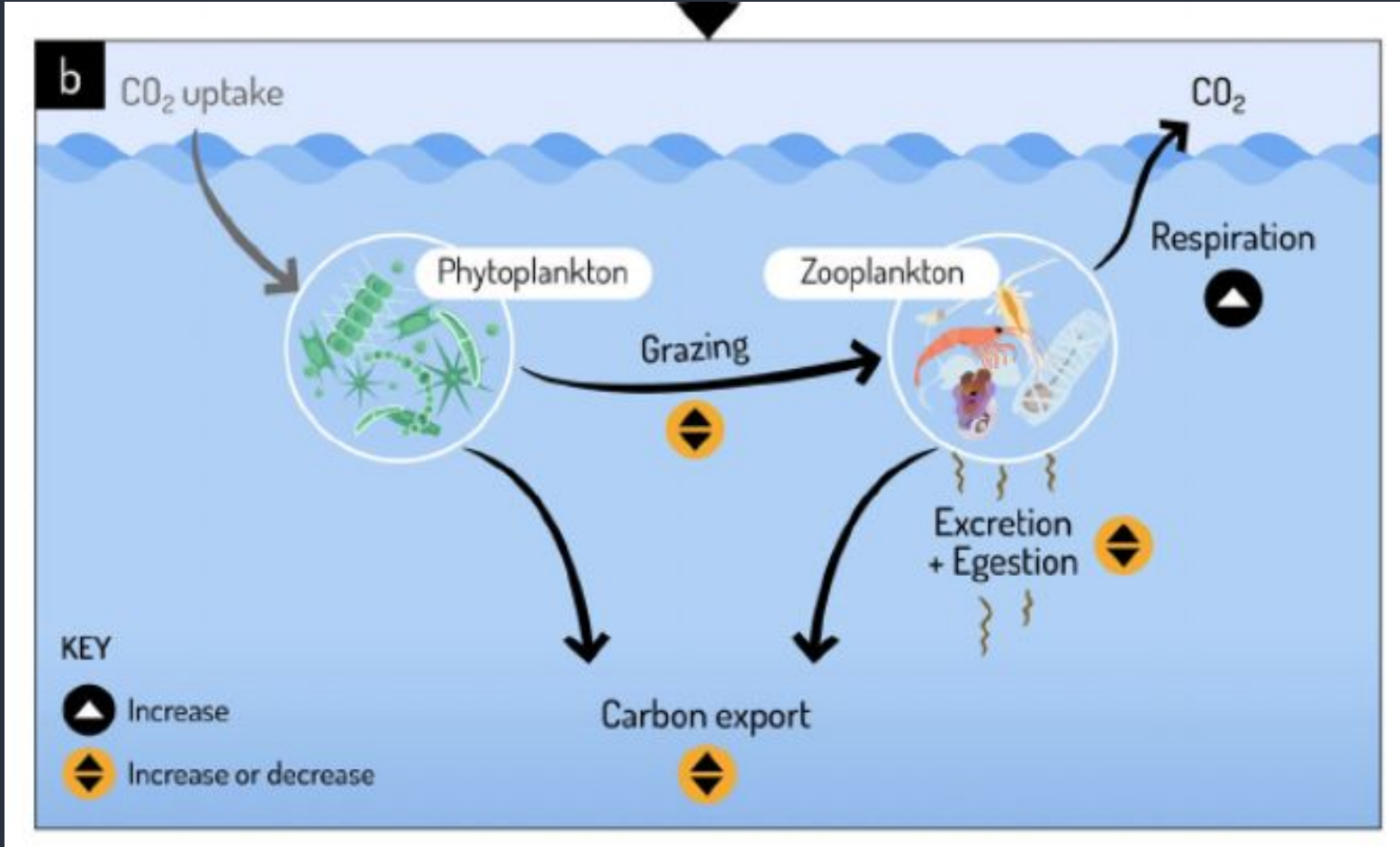
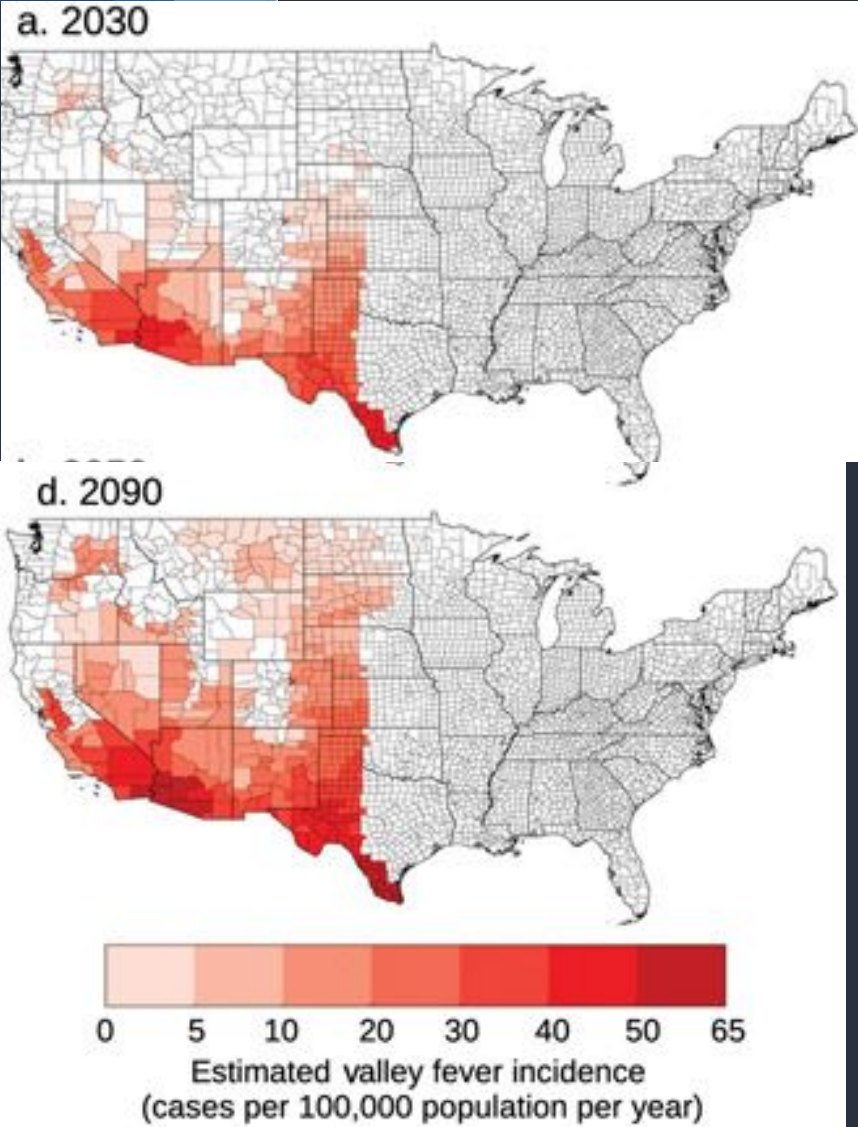
Andrea Ruedy Trimble
UNDER PRESSURE
 Art x Climate
 Appearing in the Fifth National Climate Assessment
<https://nca2023.globalchange.gov/chapter/focus-on-1/>

a) Temporal compounding of events in 2020 and 2021



Fifth National Climate Assessment
 Fig. F.1.1 <https://nca2023.globalchange.gov/chapter/focus-on-1/>

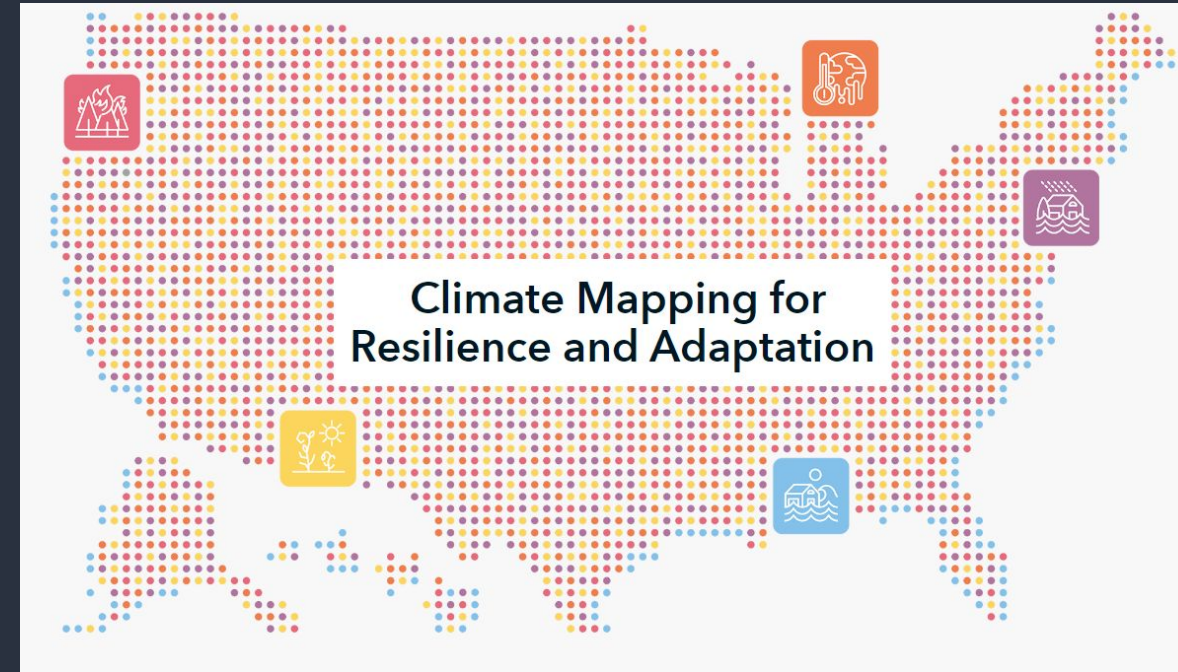
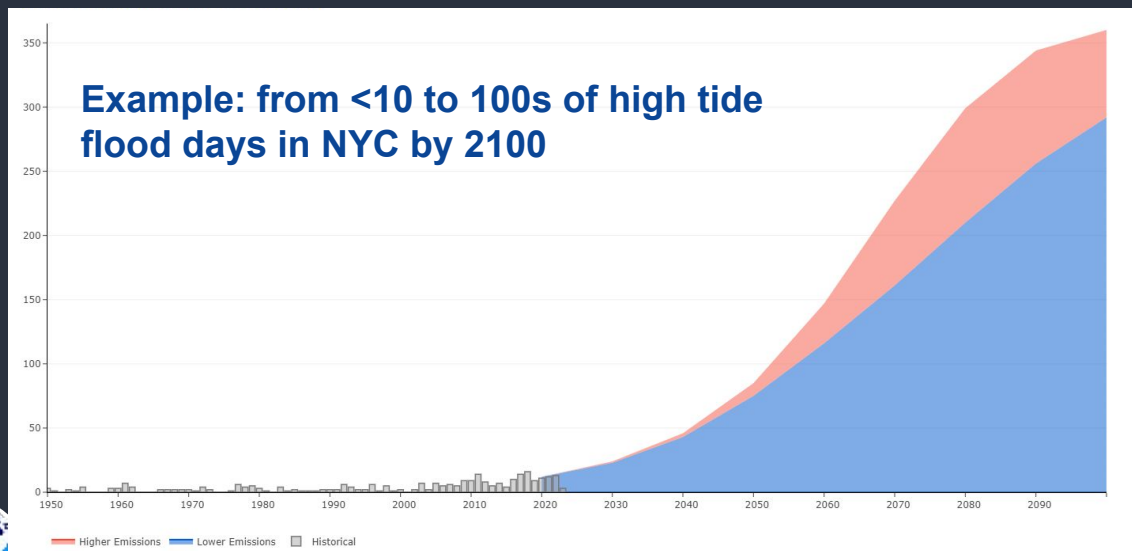
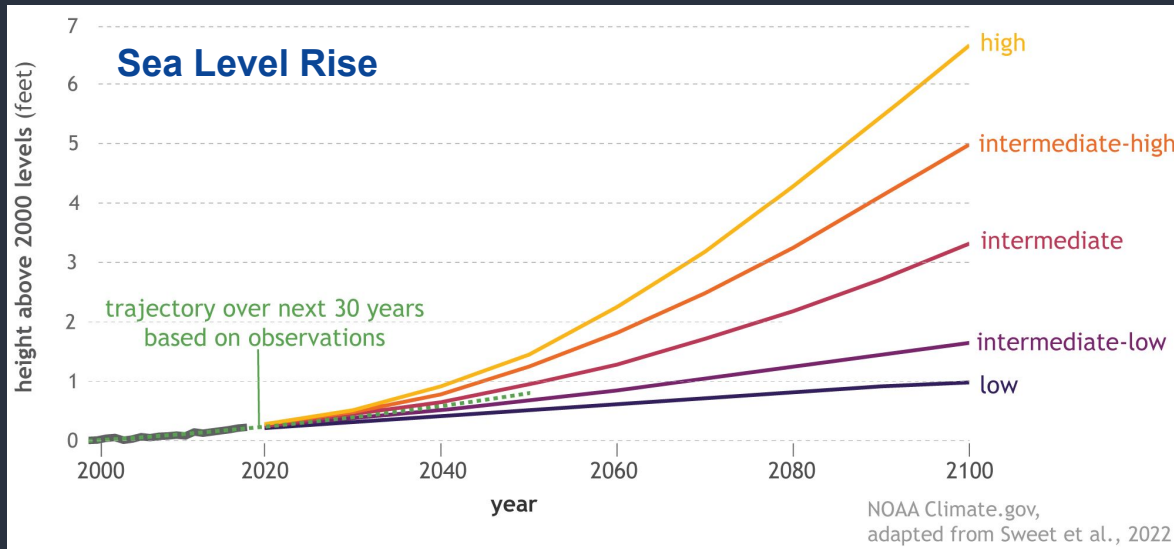
“Slower” changes matter too; Monitoring is critical!



Ratnarajah et al (2023). Monitoring and modelling marine zooplankton in a changing climate. *Nature Communications*. 14. 10.1038/s41467-023-36241-5.

Gorris et al (2021) Economic Valuation of Coccidioidomycosis (Valley Fever) Projections in the United States in Response to Climate Change. *Weather Clim Soc*. 2021;13(1):107-123. doi: 10.1175/wcas-d-20-0036.1. PMID: 34316325; PMCID: PMC8311625.

Information is available about future climate and physical risk



Accessing federal government projection information: Climate Mapping for Resilience and Adaptation www.resilience.climate.gov

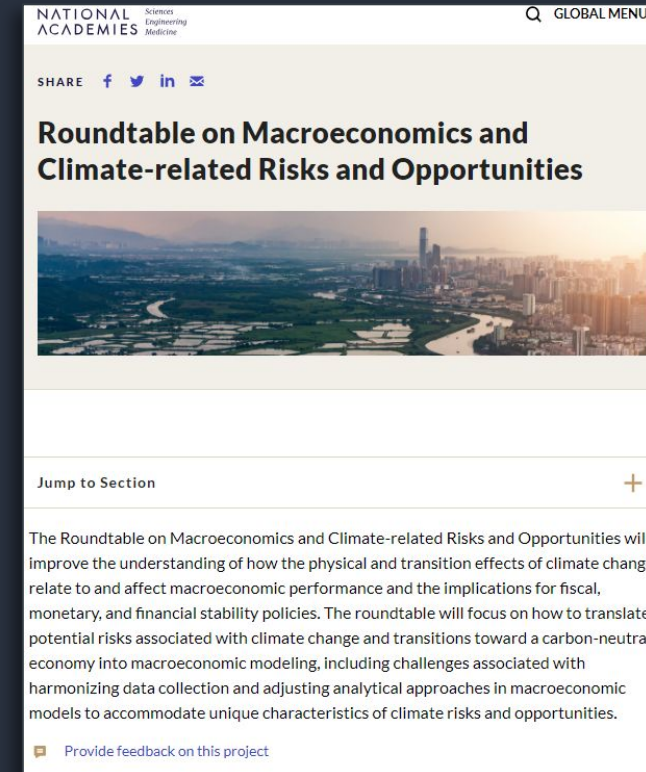
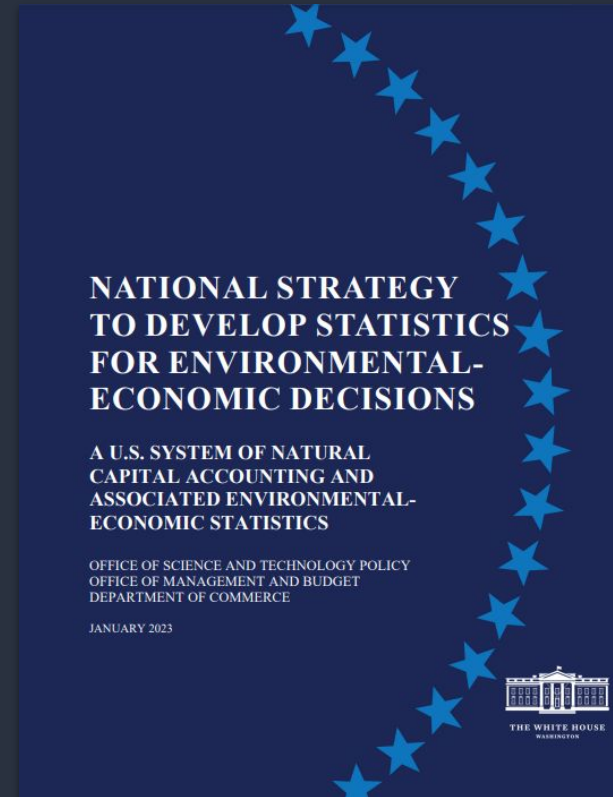
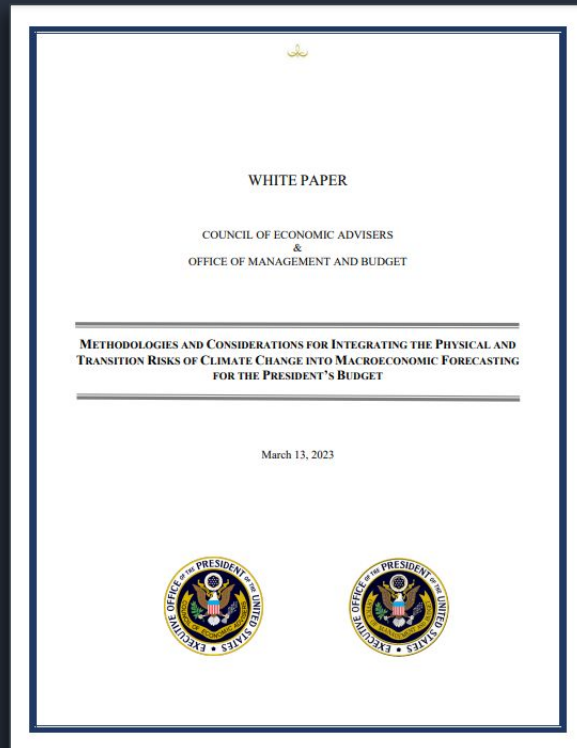
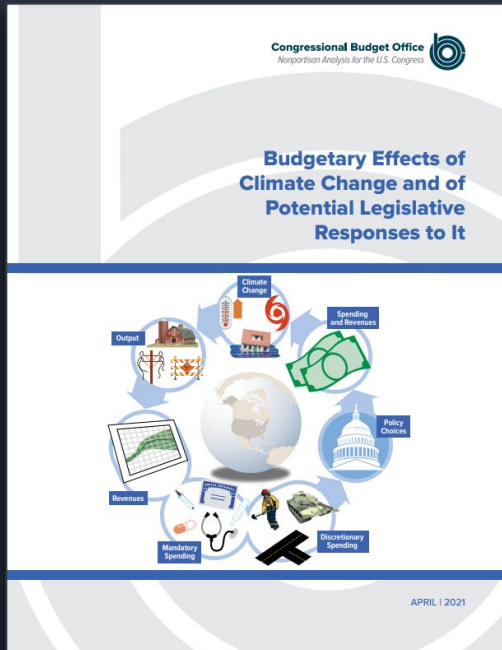


Challenge 1: More community-scale engagement needed

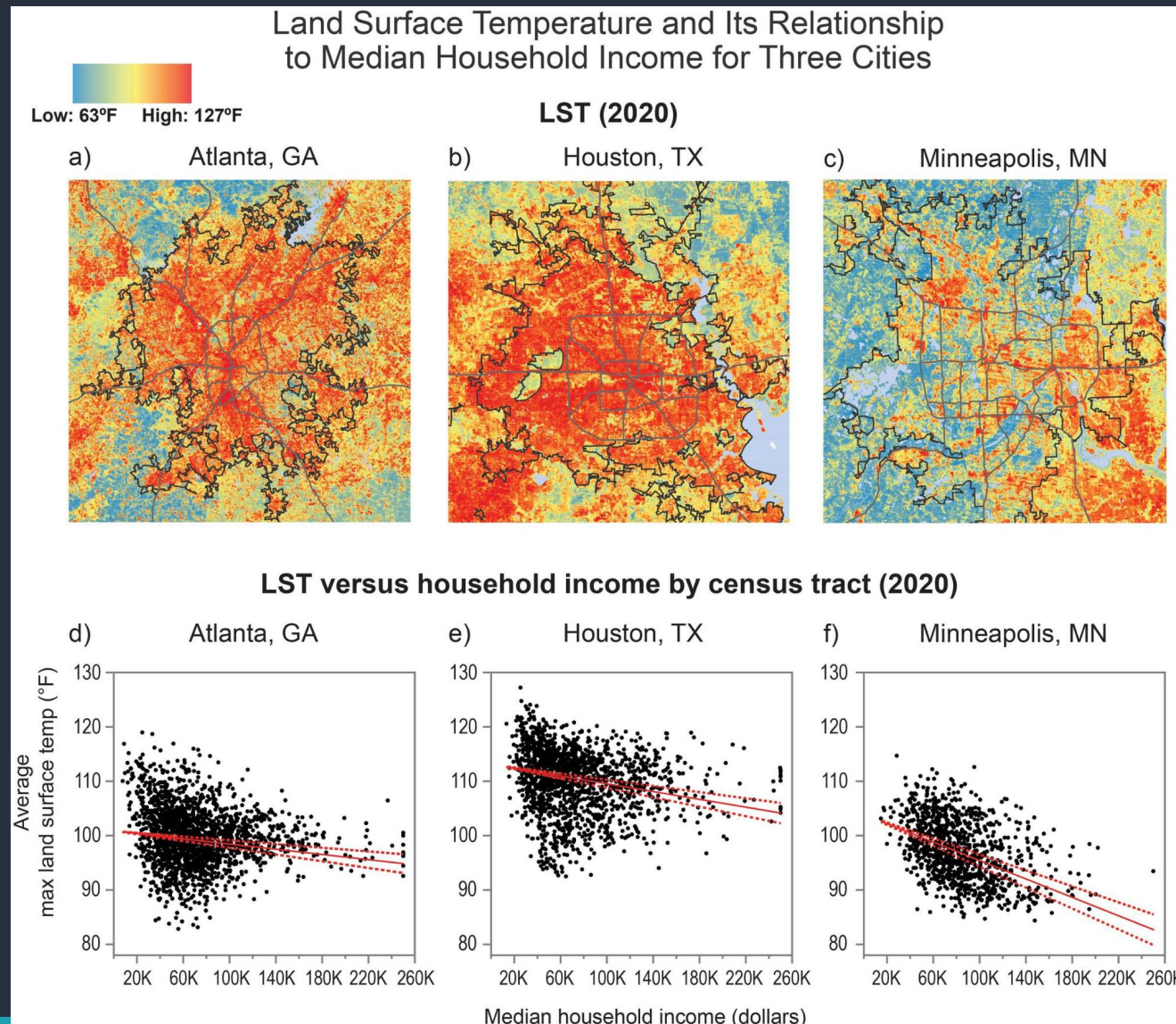


<https://www.noaa.gov/education/photos-images/photo-story-explore-noaa-resilience-community-education-projects-across>

Challenge 2: Limited understanding of our economic exposure and vulnerabilities



Challenge 3: Exposure and vulnerability to climate impacts overlap with systemic inequities



Fifth National Climate Assessment
Fig. 1.8
<https://nca2023.globalchange.gov/>



LANDSCAPE OF CLIMATE FINANCE IN 2021/2022

Global climate finance flows along their life cycle in 2021 and 2022. Values are averages of two years' data to smooth out fluctuations, in USD billions.



SOURCES AND INTERMEDIARIES

Which type of organizations are sources or intermediaries of capital for climate finance?

INSTRUMENTS

What mix of financial instruments is used?

1.27 TRILLION USD ANNUAL AVERAGE

USES

What types of activities are financed?

SECTORS

What is the finance used for?

Public

Private

