Sustainability Requires Confronting Climate Change & Ecological Degradation Together

March 23, 2023

Rosina Bierbaum
University of Michigan &
University of Maryland

Drivers

Source: Modified from Johan Rockstrom: Let the environment guide our development

World Economic Forum Global Risk Reports

	1	2	3	4	5
2020	Extreme weather	Climate action failure	Natural disasters	Biodiversity loss	Human-made environmental disasters
2021	Extreme weather	Climate action failure	Human environment damage	Infectious diseases	Biodiversity loss
2022	Climate action failure	Extreme weather	Biodiversity loss	Social cohesion erosion	Livelihood crises
2023	Failure to mitigate climate change	Failure of climate change adaptation	Natural disasters	Biodiversity loss	Large-scale involuntary migration

Global risks ranked by severity over the long term (10 years)

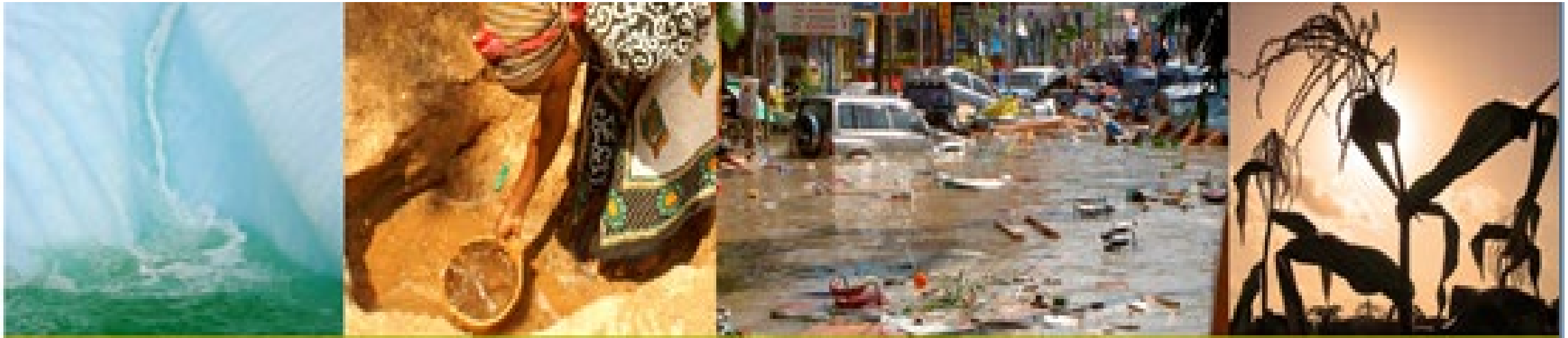
https://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf
https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf

https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf
https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf

Climate change is causing societal impacts NOW

- Ideal ranges for crops, forests, & pests are shifting
- Timing, quantity, and quality of water less predictable
- Extreme weather events are increasing human pain and costs:
  - ❖crop losses from floods and droughts; forest die-offs
  - ❖health problems from heat, smog & increased pest ranges
  - ❖coastal erosion and infrastructure loss
  - ❖Loss of species ranges and ecosystem integrity
  - ❖increased energy/water disruption
  - ❖power of strongest storms increasing
  - ❖global supply chain interruptions

All linked to climate change by theory, models, & "fingerprints" (attribution analysis). Many are growing faster than previously predicted.



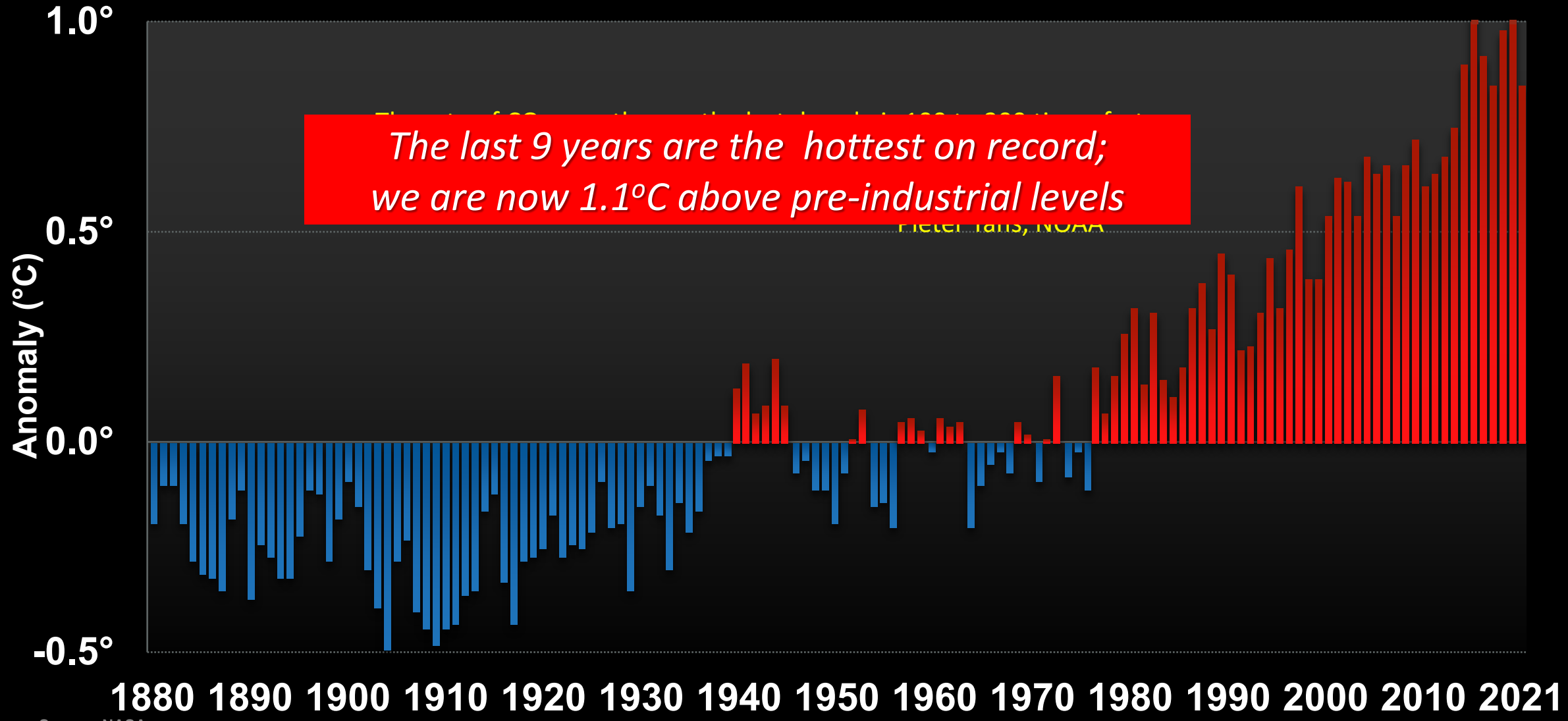
Atmospheric CO_2 is now higher than it's been for **2 million years***
.....and increasing rapidly

This graph, based on the comparison of air bubbles in ice cores and more recent direct measurements, shows how dramatically atmospheric CO_2 has increased since the Industrial Revolution. (Source: NOAA)

*A.1.3 of https://www.ipcc.ch/report/ar6/syr/

Global Surface Temperature – Departure from Average

1880 – 2021



Source: NASA

Climate change: IPCC report is 'code red for humanity'

By Matt McGrath
Environment correspondent

9 August 2021 | Comments

COP26

Human activity is changing the climate in unprecedented and sometimes irreversible ways, a major UN scientific report has said.

Major climate changes inevitable and irreversible - IPCC's starkest warning yet

Report warns temperatures likely to rise by more than 1.5C bringing widespread extreme weather

- IPCC's verdict on climate crimes of humanity: guilty as hell
- Climate crisis 'unequivocally' caused by humans, says IPCC

We are walking when we should be sprinting!"

IPCC CHAIR,3/20/2023

The world is approaching "irreversible" levels of global heating, with catastrophic impacts rapidly becoming inevitable; and it is "now or never" to take drastic action to avoid disaster.

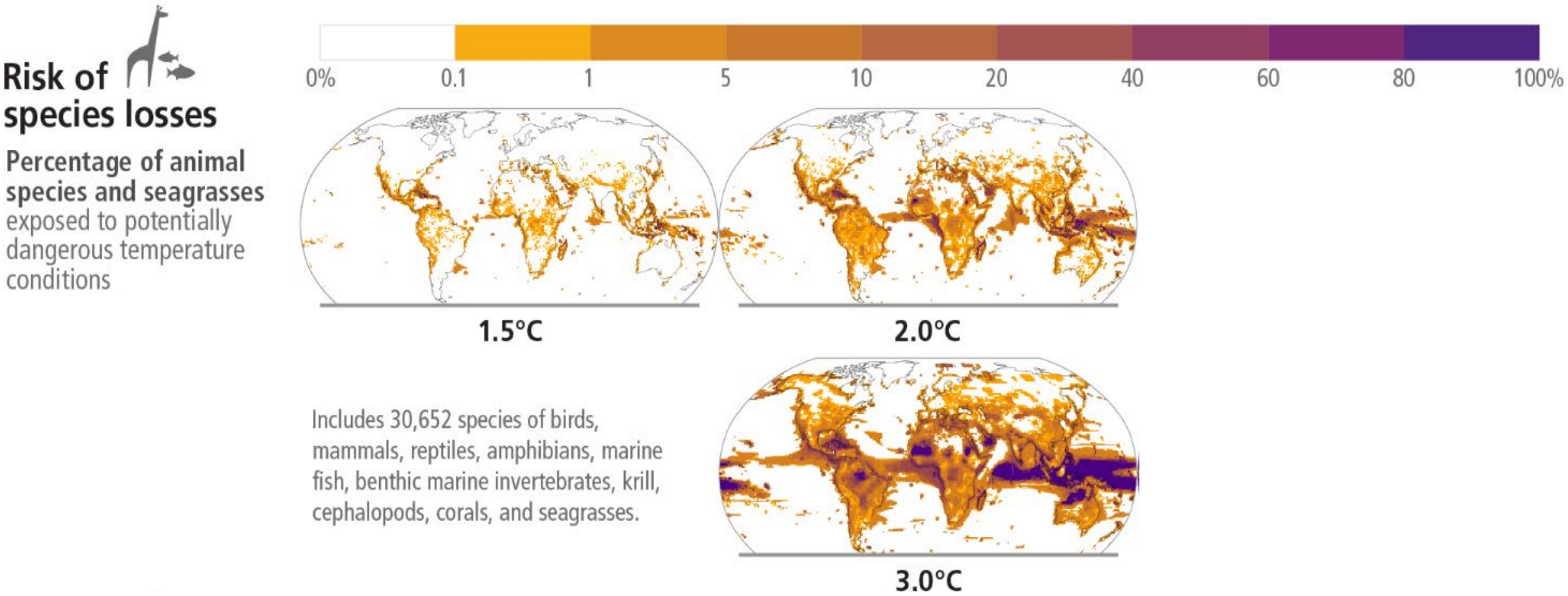
Adverse impacts from human-caused change will intensify

Water scarcity and food production

Health and wellbeing

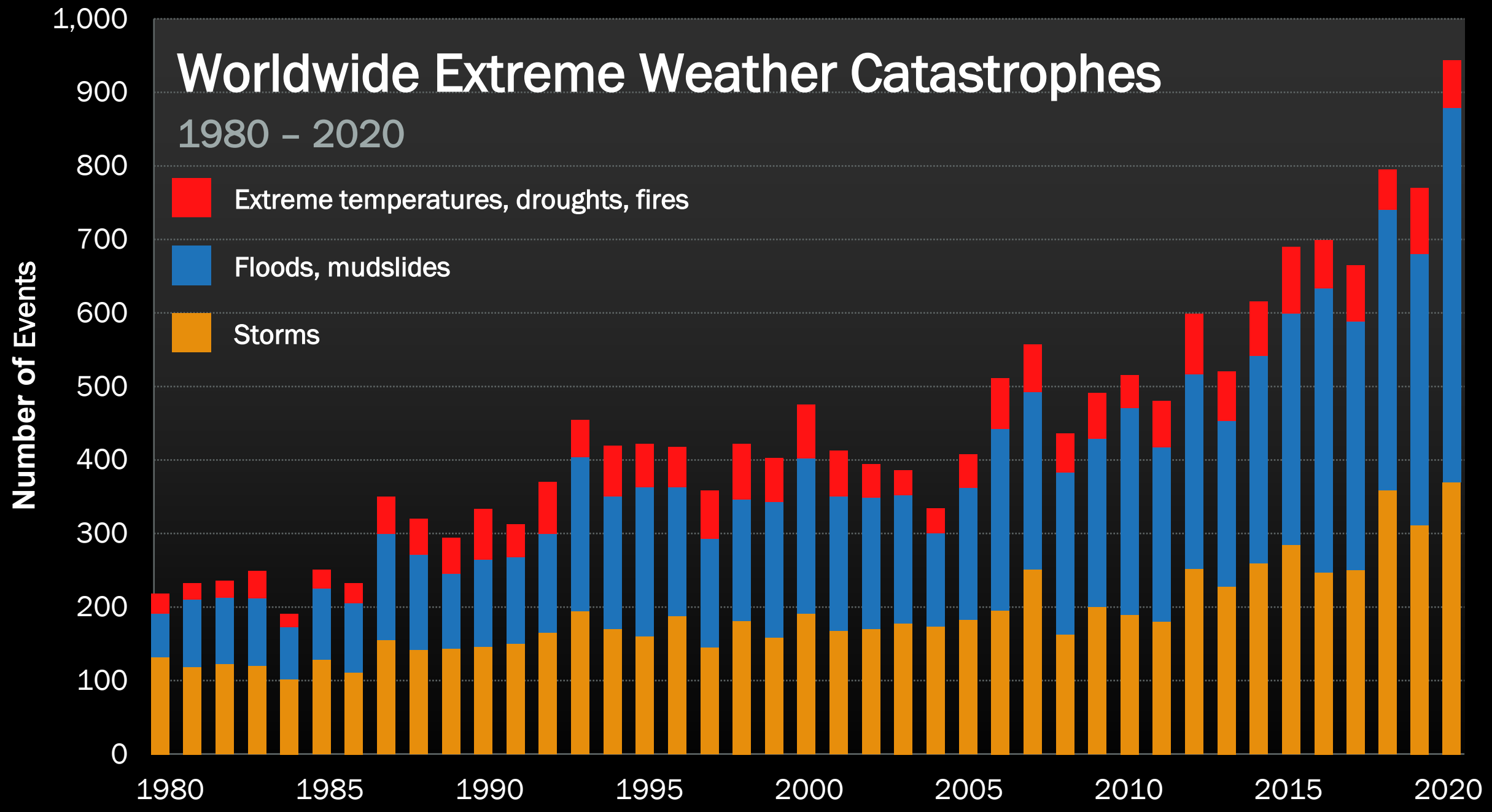
Cities, settlements and infrastructure

Ecosystem structure, species range shifts and changes in timing



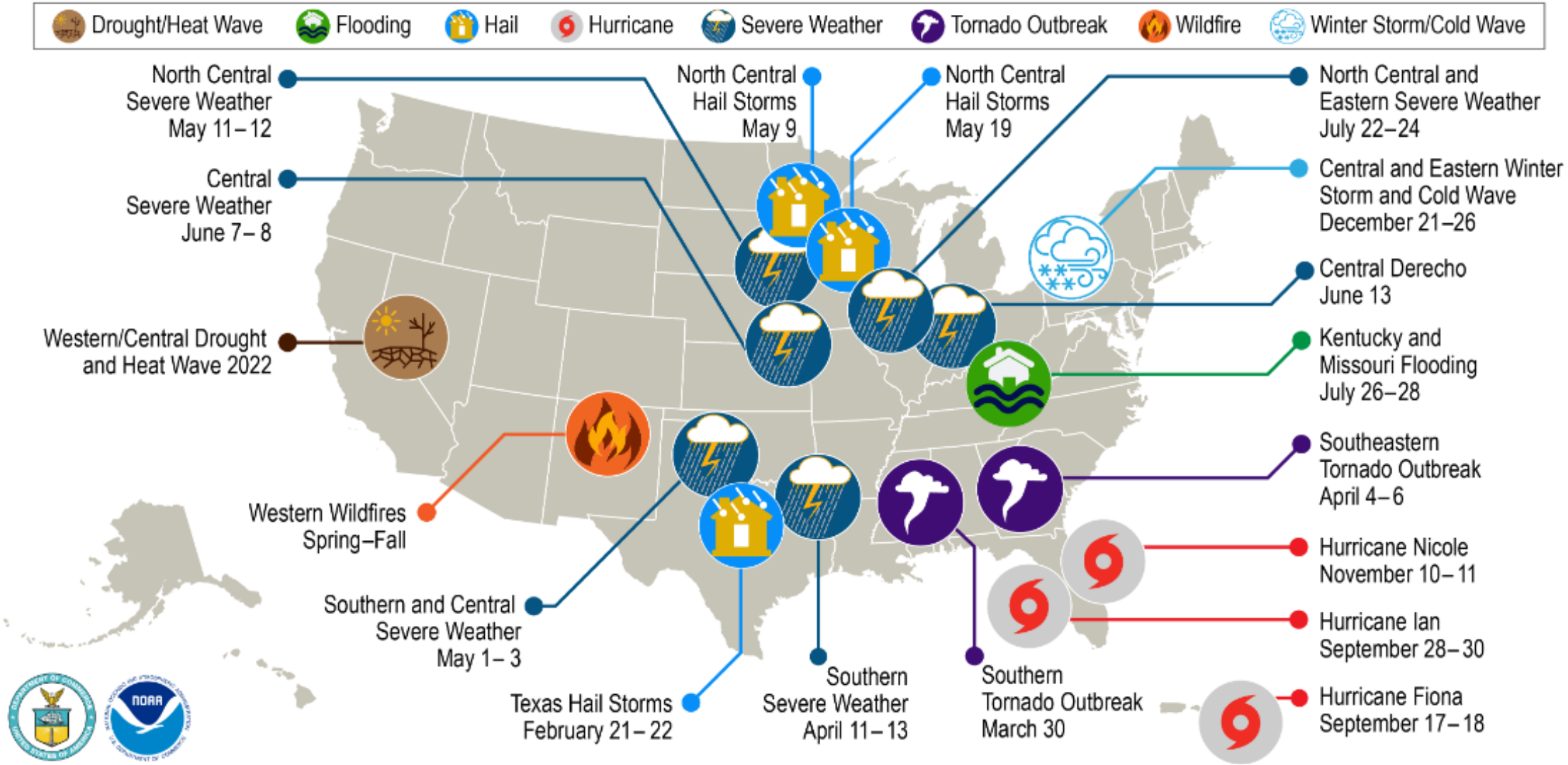
SYNTHESIS REPORT OF THE IPCC SIXTH ASSESSMENT REPORT (AR6) – March 20, 2023

https://www.ipcc.ch/report/sixth-assessment-report-cycle/



Data: 2017 Munich Re, Geo Risks Research, NatCatSERVICE. As of 2021.

U.S. 2022 Billion-Dollar Weather and Climate Disasters

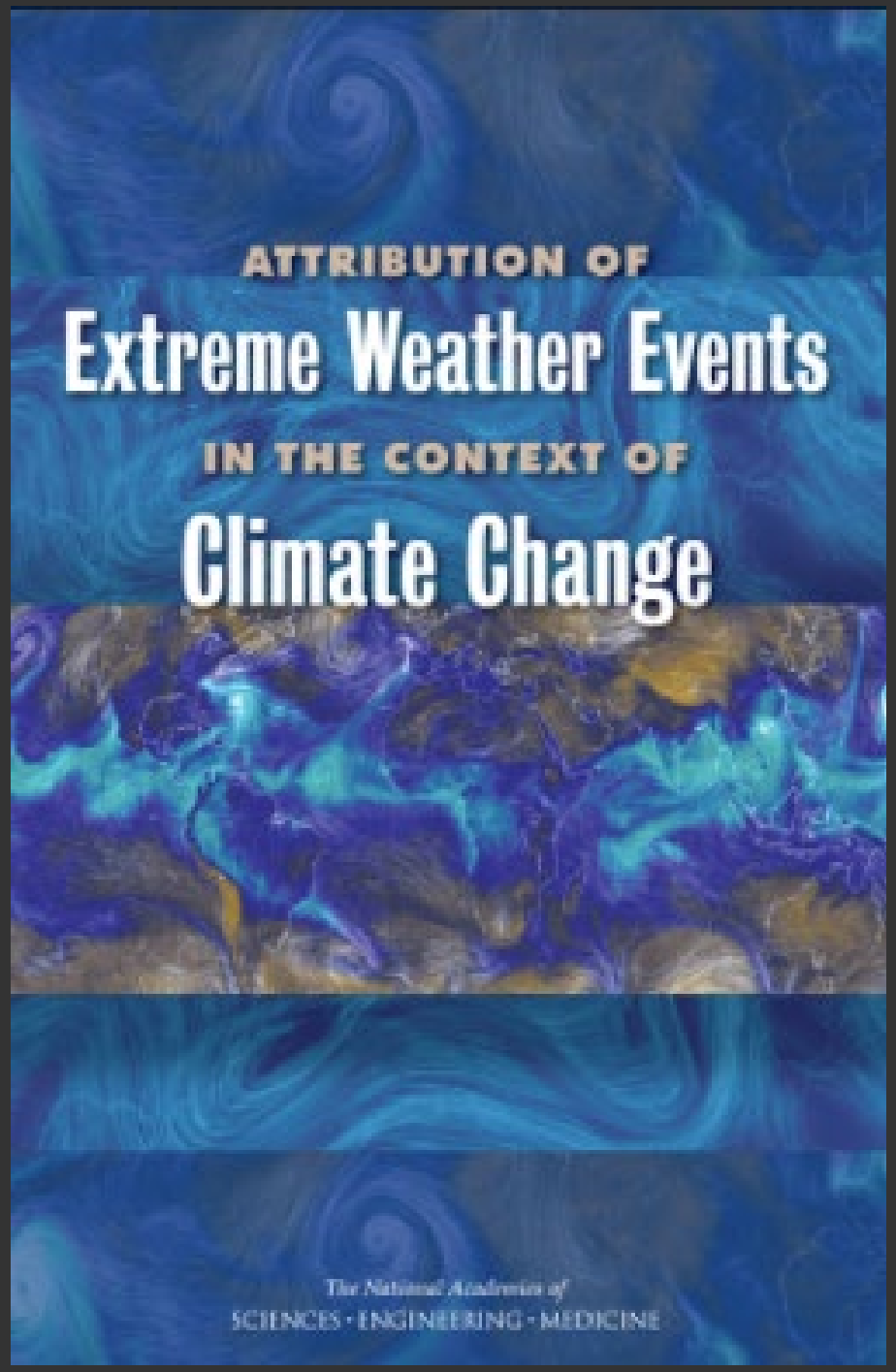


*This map denotes the approximate location for each of the **18 separate billion-dollar weather and climate disasters that impacted the United States in 2022.***

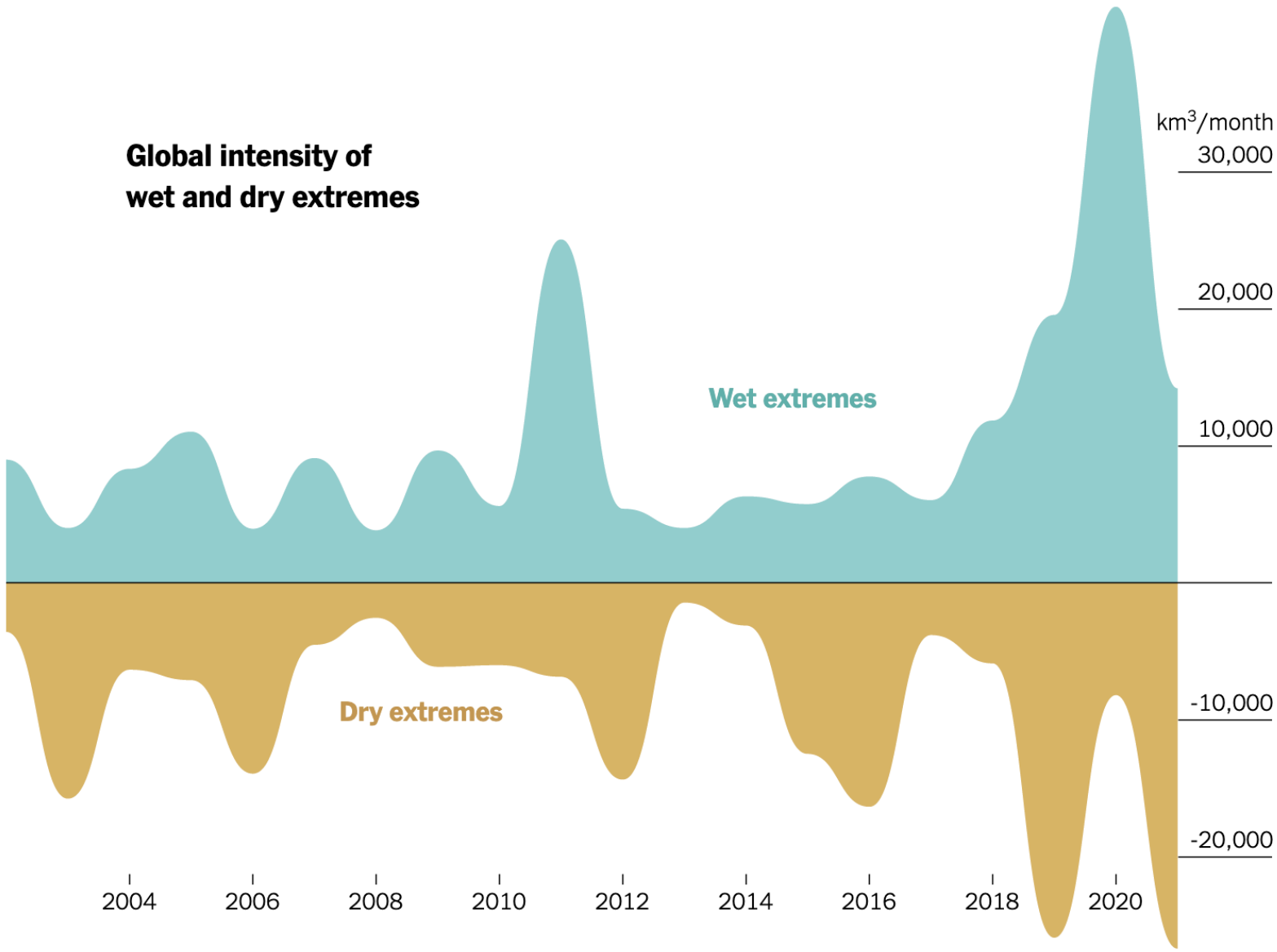
NAS Report:

”In the past, a typical climate scientist’s response to questions about climate change’s role in any given extreme weather event was ‘we cannot attribute any single event to climate change.’ The science has advanced to the point that this is no longer true as an unqualified blanket statement.”

- National Academies, March, 2016



The New York Times



Source: Rodell and Li, Nature Water (2023), based on analysis of NASA Grace and Grace-FO data. • Note: Multi-year events are assigned to the year with peak intensity.

More flooding now resulting from bigger downpours

Warmer atmosphere holds more water, so more can & does come down at one time. Slower-moving storm systems further increase the downpours.

"Hundred-year" floods now occur once a decade or more in many places.

Three "five-hundred-year" floods occurred in Houston in three years.

USA, Europe, India, Japan, and Africa have all been hit hard in 2018-2022

Washington Post

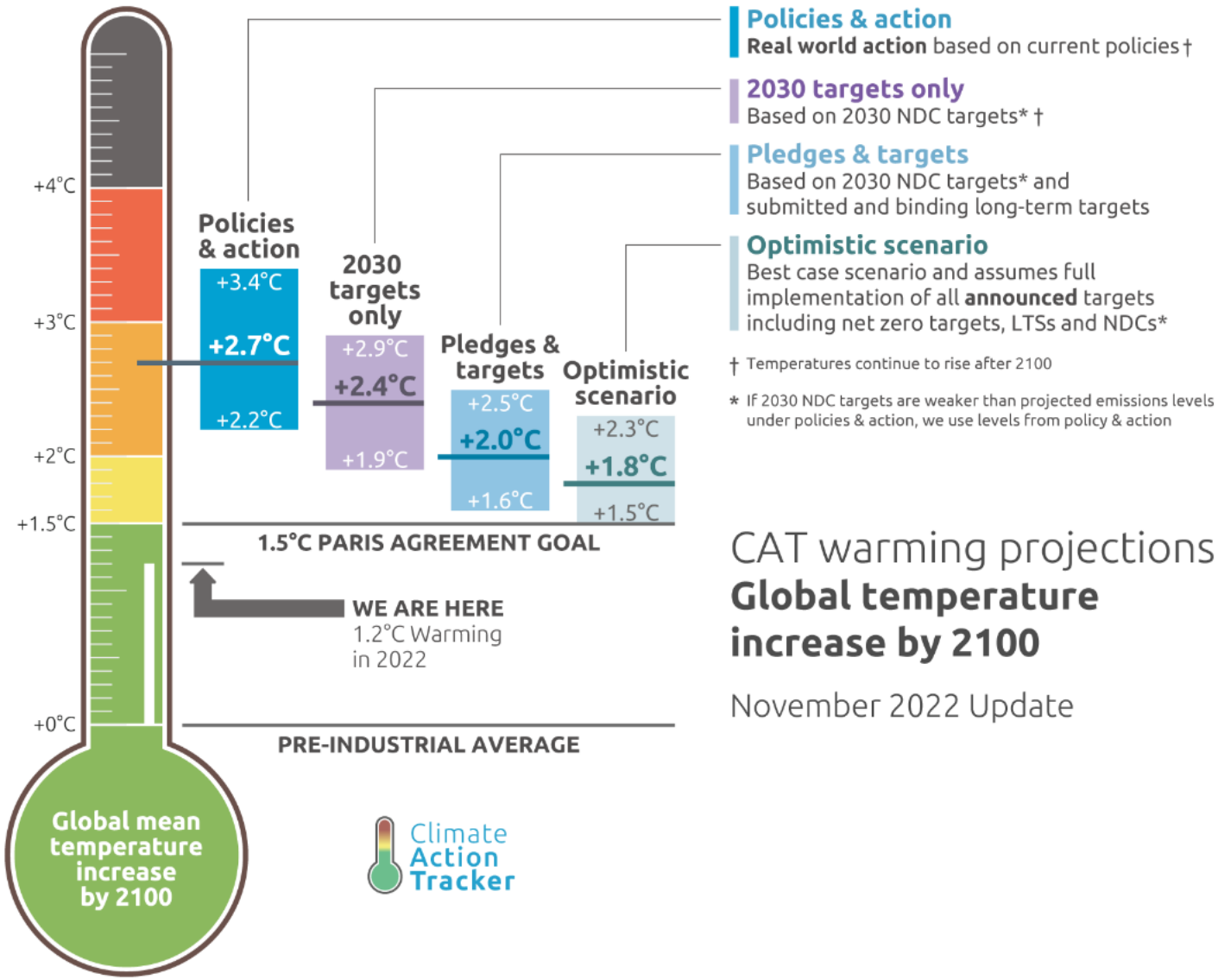
Jackson, Kentucky, July 2022

Canal Rd, Washington DC, July 2019

Hurricane Harvey: >50 inches of rain in 4 days to Texas, August 2017; 40% more likely in climate-changed world of today.

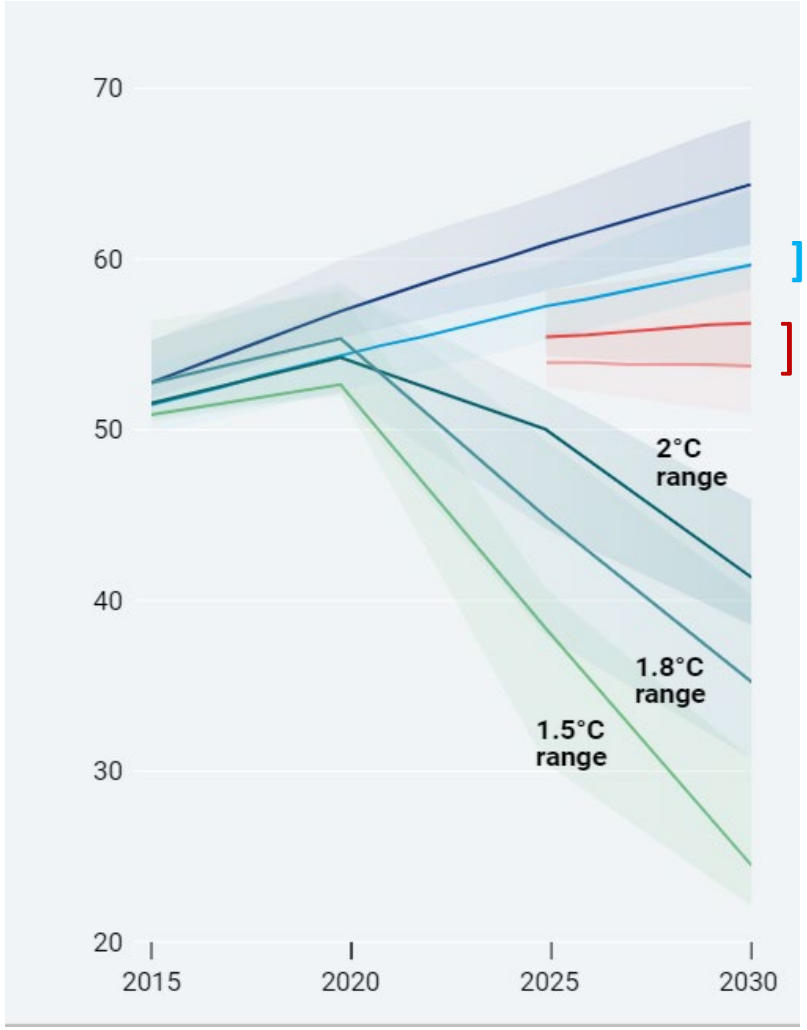
Attributing Extreme Weather to Climate Change

https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the-world



CAT warming projections
Global temperature increase by 2100

November 2022 Update



The Near Term

] Current Baseline

] Range of reductions from Global Commitments

] The Need

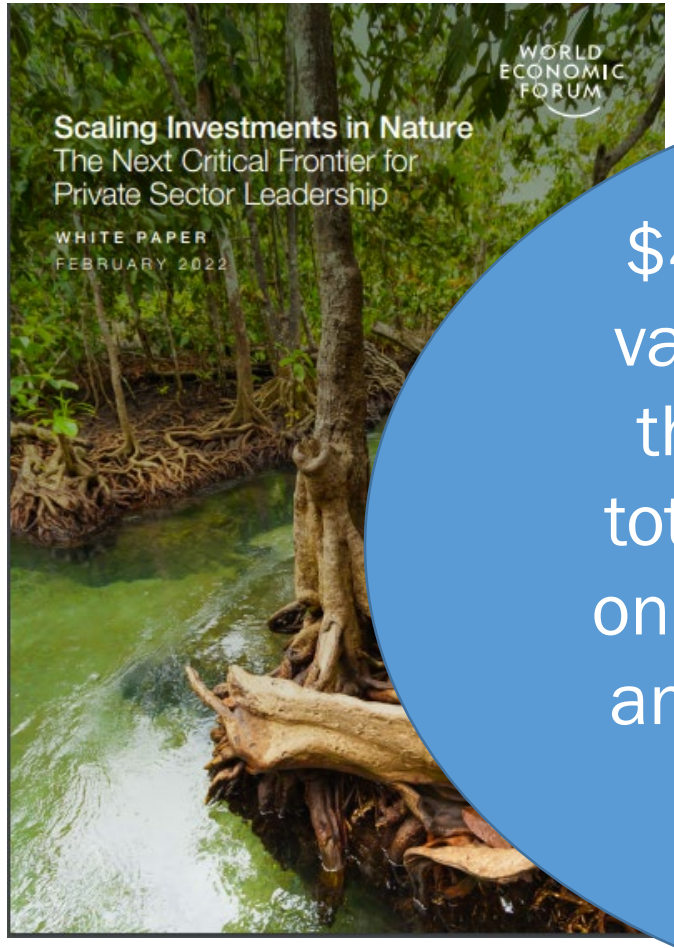
UNEP 2019 Gap Report

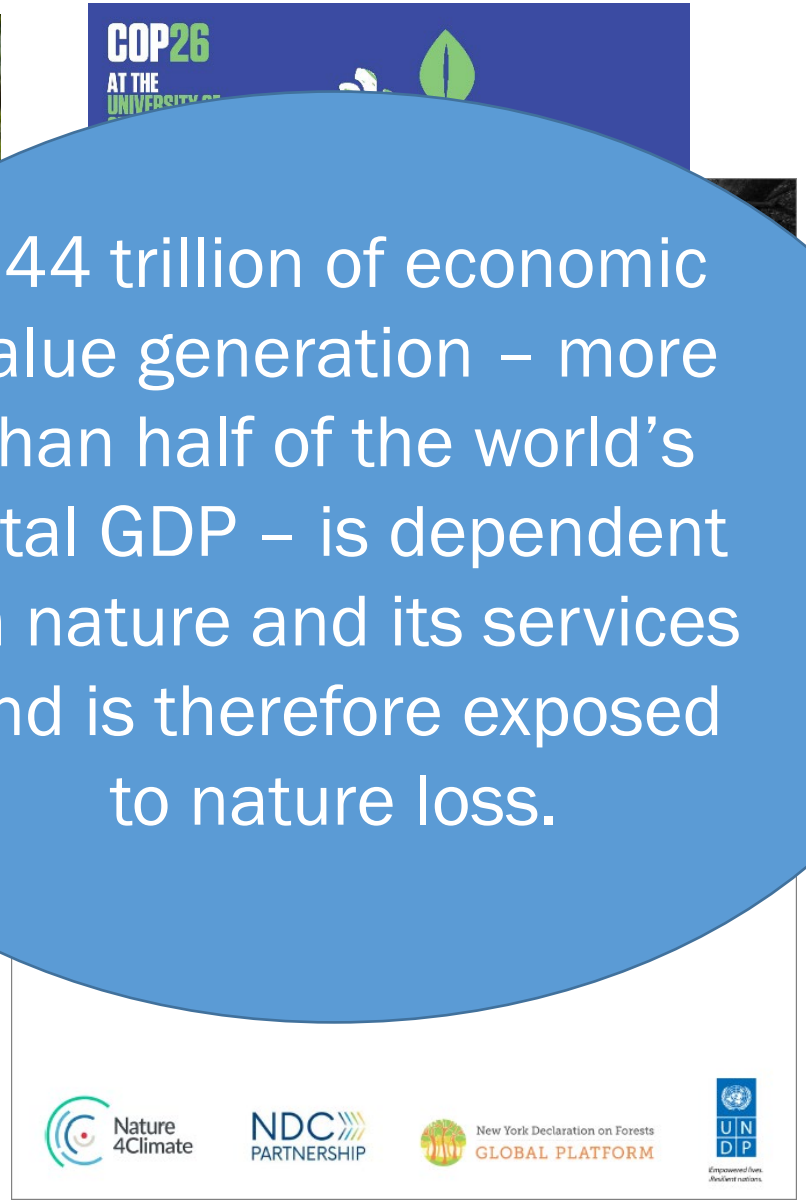
Nature can help meet climate targets

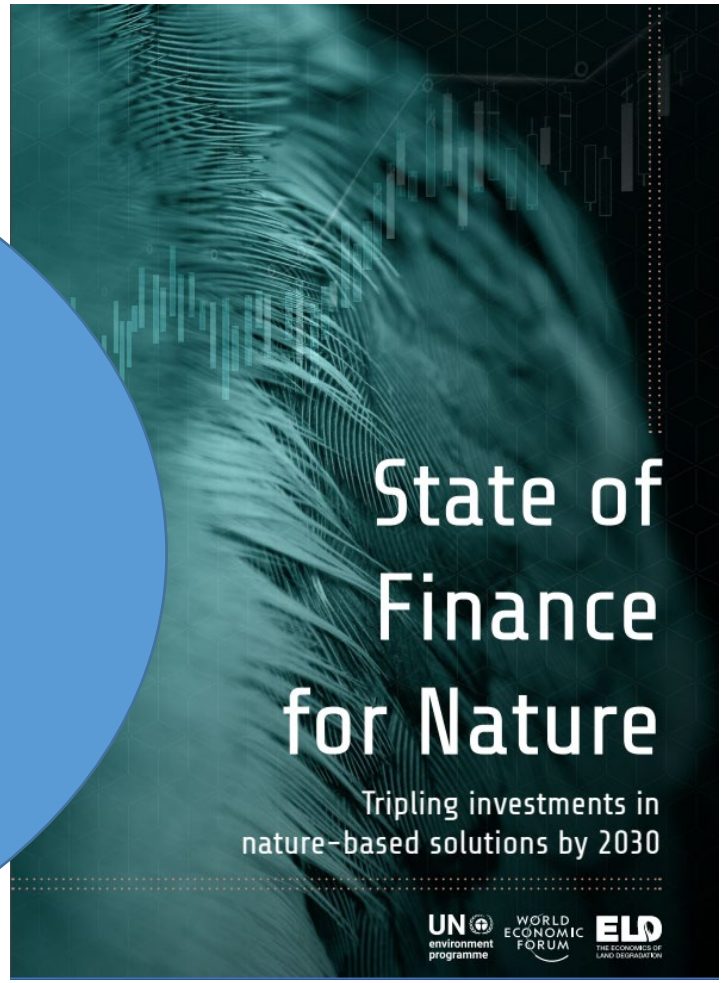
Country commitments can include more
nature-based solutions
and help meet the climate and biodiversity goals.

Source: Griscom et al., PNAS (2017) and Griscom et al., 2020 Philosophical Transactions of the Royal Society B. Graphics from Nature Conservancy magazine and SW Infographics

New Trend: Finance Nature-Based Solutions







$44 trillion of economic value generation – more than half of the world's total GDP – is dependent on nature and its services and is therefore exposed to nature loss.

Problems	Examples of Nature-based solutions
Greenhouse gas emissions	• Conserving/restoring coastal habitats, forests, wetlands, grasslands • Improved agricultural management, including cover crops, no-till, rotational grazing, and sustainable timber management
Heat stress, Air pollution	• Green roofs • Urban trees and forests
Inland flooding/ non-point pollution	• Enhanced water storage in wetlands, forests, or farmland • Protecting or restoring riparian buffers • Sustainably managing forests, farms, and grazing lands
Crop loss	• Planting pollinator habitats • Integrated pest management

White House Council on Environmental Quality, White House OSTP, White House Domestic Climate Policy Office, 2022. Opportunities for Accelerating Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity. Report to the National Climate Task Force. Washington, D.C.

Inflation Reduction Act and Infrastructure & Jobs Act will help with climate mitigation, adaptation & nature

Examples of Nature-Based Solutions

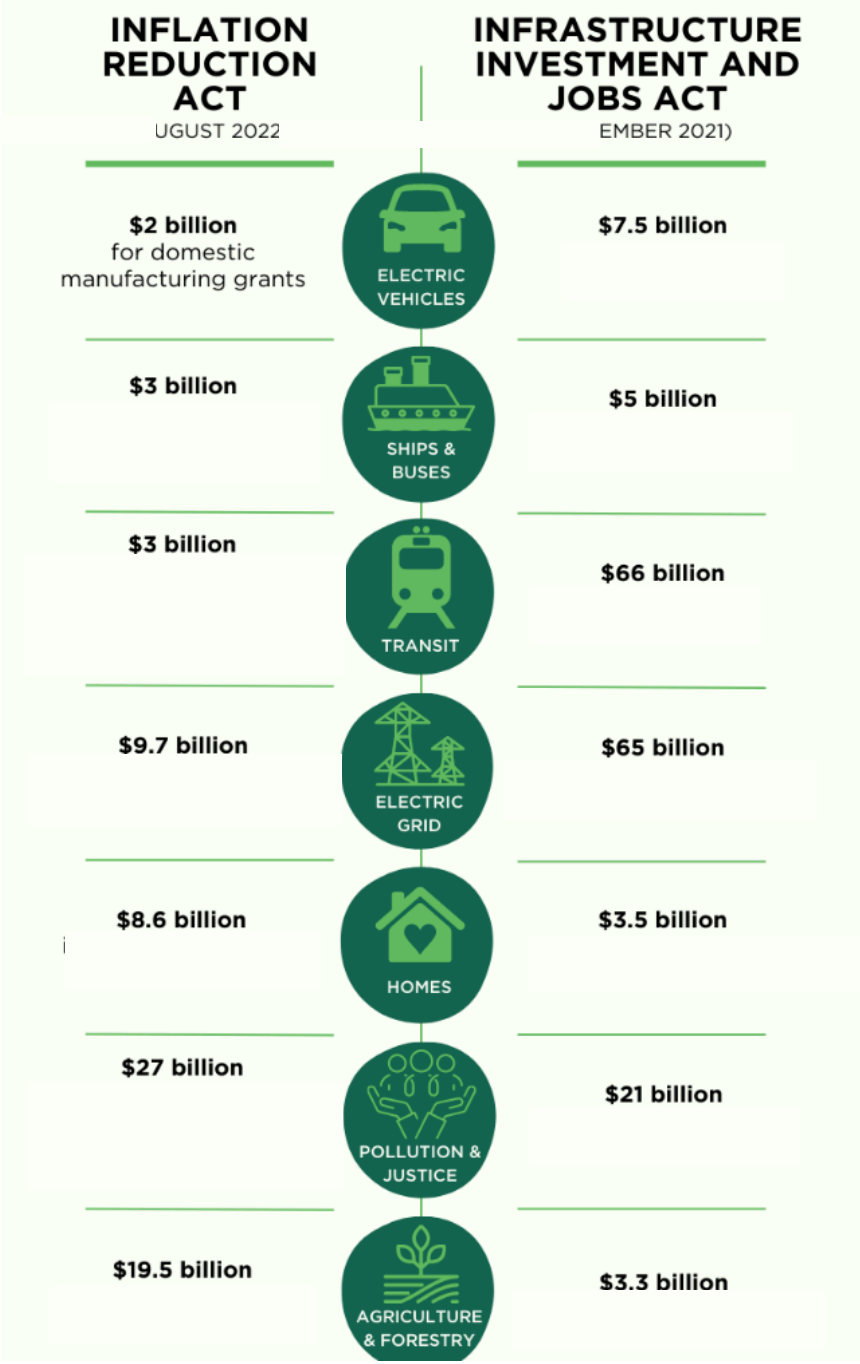
IRA

- $20 B for five USDA programs
- $2 B for ecosystem restoration
- $3 B for wildfire risk reduction
- $2 B to the Urban/Community Forestry Program

IIJA

- $3.5 B for the Flood Mitigation Assistance program
- $2.5 B for coastal storm risk management
- $1.4 B for the PROTECT program
- $1 B for the FEMA's BRIC Program
- $500 M for the STORM Act
- $500 M for the Healthy Streets
- $350 M for the Wildlife Crossings Pilot

Climate Investments in IRA and IIJA



EESI

Sources: Sen. Cantwell, the White House, BlueGreen Alliance, National Wildlife Federation, Evergreen Action, Bipartisan Policy Center

Graphic by: Alison Davis

IIJA Mitigation and Adaptation Funding Examples

		MD $2.7 B	TX $14.2 B	MA $3.6 B	LA $4.3 B	IO $2.4 B	IL $8.4 B
Public Transit	**5-year expected state allotment**	**$1.8 B**	**$3.4 B**	**$2.8 B**	**$0.5 B**	**$0.3 B**	**$4.5 B**
	State-allocated funds to date in 2022&23	$347M	$644 M	$535 M	$91 M	$60 M	$850 M
EV Charging Network	**5-year expected state allotment**	**$63 M**	**$408 M**	**$63 M**	**$73 M**	**$51 M**	**$149 M**
	State-allocated funds to date in 2022&23	$23 M	$147 M	$23 M	$27 M	$19 M	$54 M
Clean Buses	EPA Clean School Bus Program	$9 M	$51 M	$30 M	$44 M	$11 M	$48 M
	DOT's Low&NoEmissions, Bus Facilities Programs	$17 M	$78 M	$135 M	$7 M	$5 M	$29 M
Clean Energy & Power	Weatherization	$46 M	$173 M	$80 M	$31 M	$45 M	$156 M
	State Energy Program	$7 M	$33 M	$8 M	$11 M	$6 M	$14 M
	Energy Efficiency & Conservation Block Grant Program	$7 M	$29 M	$8 M	$9 M	$5 M	$15 M
	Grid Reliability (additional funding will be made available in the coming months)	$4 M	$31 M	$5 M	$320 M	$6 M	$8 M

These rounded values are estimates from the White House State IIJA Fact Sheets. The numbers may change based on updated factor data each fiscal year.

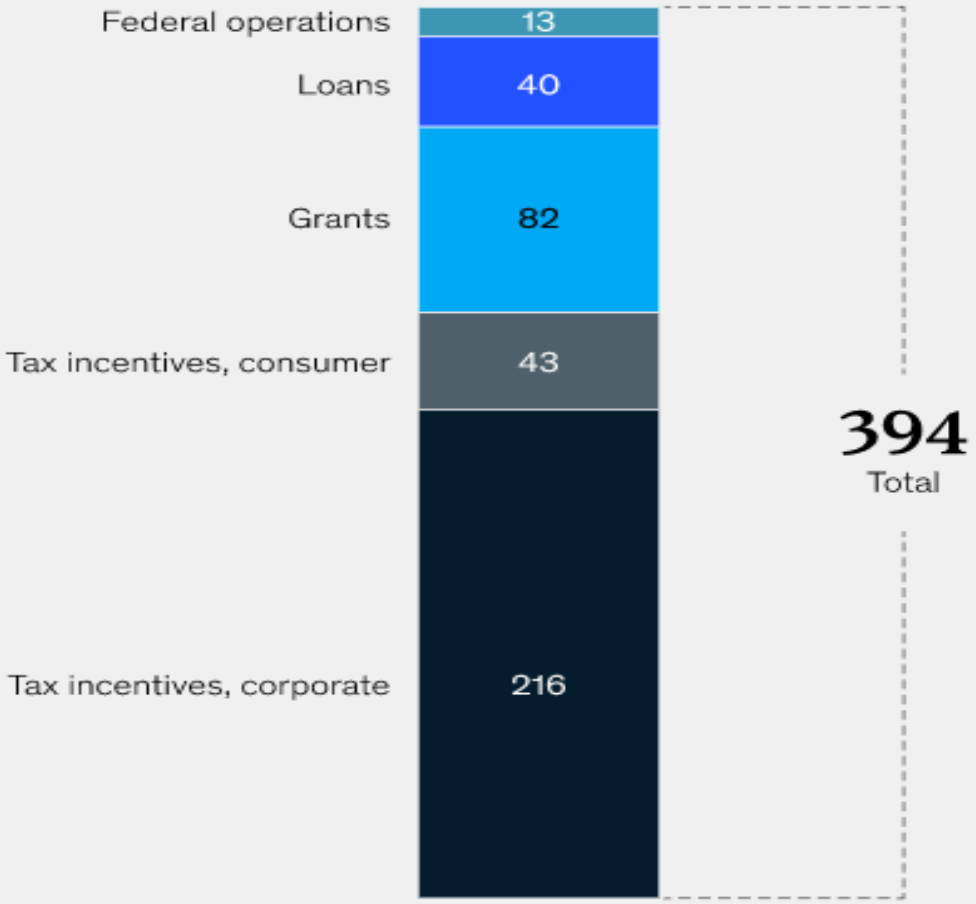
Comparing Resilience Funding and the Cost of Inaction

		MD	TX	MA	LA	IO	IL
Infrastructure Resilience Funding	Announced funding to date in 2022 & '23 Includes protection against flooding, wildfires, and cyberattacks	$157 M	$819 M	$93 M	$377 M	$71 M	$1.3 **B**
Cost of Extreme Weather Event Damages	Average yearly costs from 2010- 2020	$0.5 B	$24 B	$0.5B	$20 B	$5 B	$5 B

These values use the estimates from the White House State IIJA Fact Sheets. The numbers may change based on updated factor data each fiscal year.

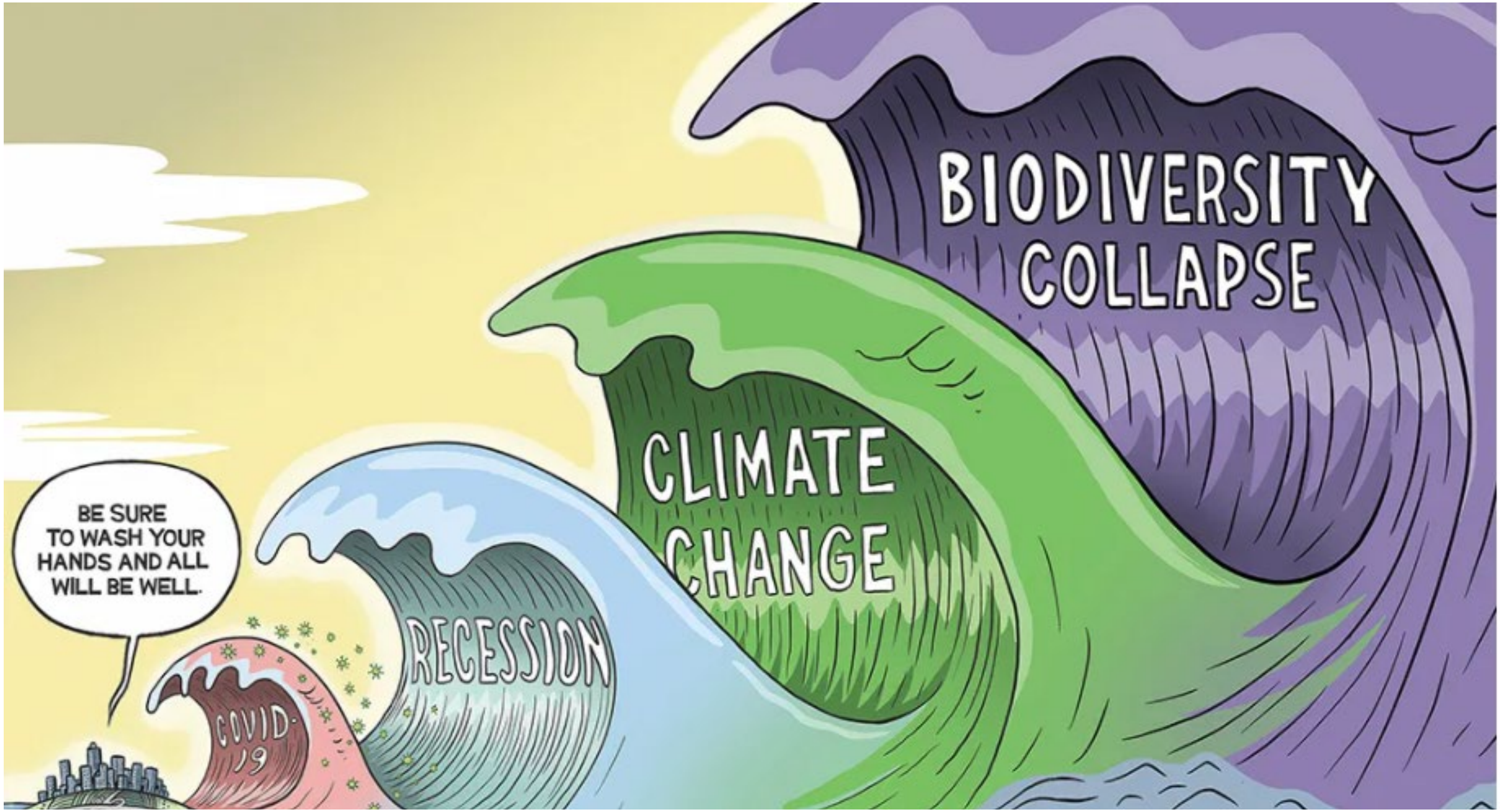
Corporations, individuals, and state and local governments are all eligible to receive funding in the energy portion of the Inflation Reduction Act.

Energy and climate change funding in the Inflation Reduction Act, $ billion



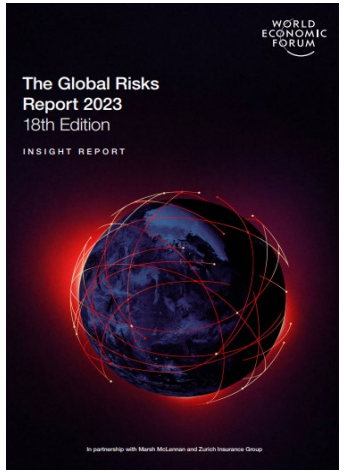
Note: This exhibit reflects analysis of the appropriation figures contained in the Inflation Reduction Act, as well as those reported by the Congressional Budget Office and Joint Committee on Taxation. This analysis may differ from other analyses due to differences in methodology.
Source: Inflation Reduction Act of 2022, H.R. 5376, 117th Cong. (2021–22)

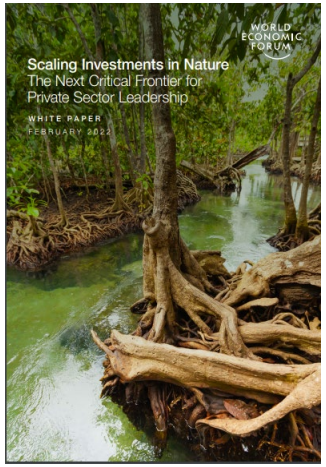
McKinsey & Company

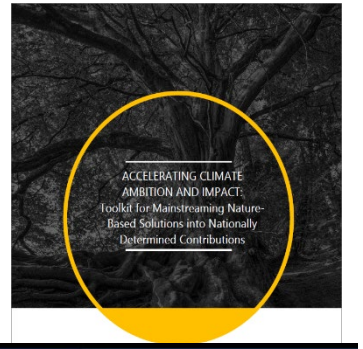

BE SURE TO WASH YOUR HANDS AND ALL WILL BE WELL.
COVID-19
RECESSION
CLIMATE CHANGE
BIODIVERSITY COLLAPSE

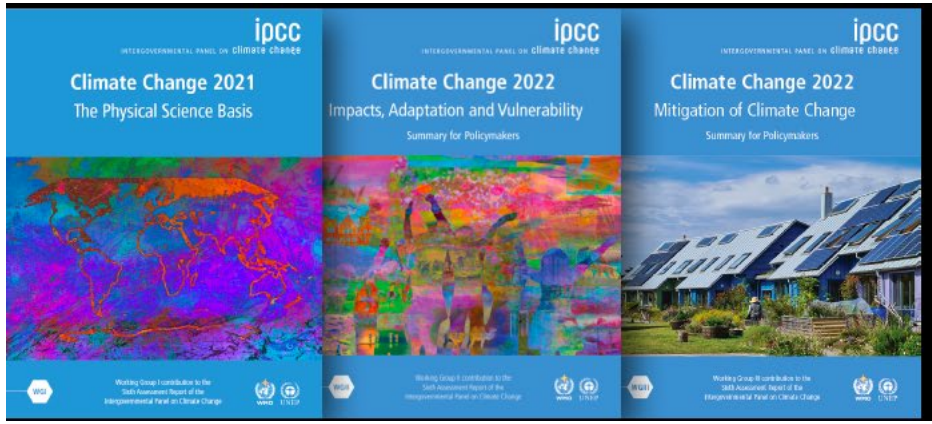
There is great momentum to take climate-positive and nature-positive actions rapidly

- Drumbeat of science
- Impacts are being felt and are expensive
- Attribution of climate change impacts on extreme events
- Climate change can't be solved without nature; biodiversity can't be preserved without slowing climate change
- Cost of cleaner technologies dropping fast
- Cities, states, & countries are taking action
- Businesses are responding and taking risk seriously
- Investment community is activated!









Actions taken this decade will determine the future
Bangladesh • © Gary Braasch/World View of Global Warming.org