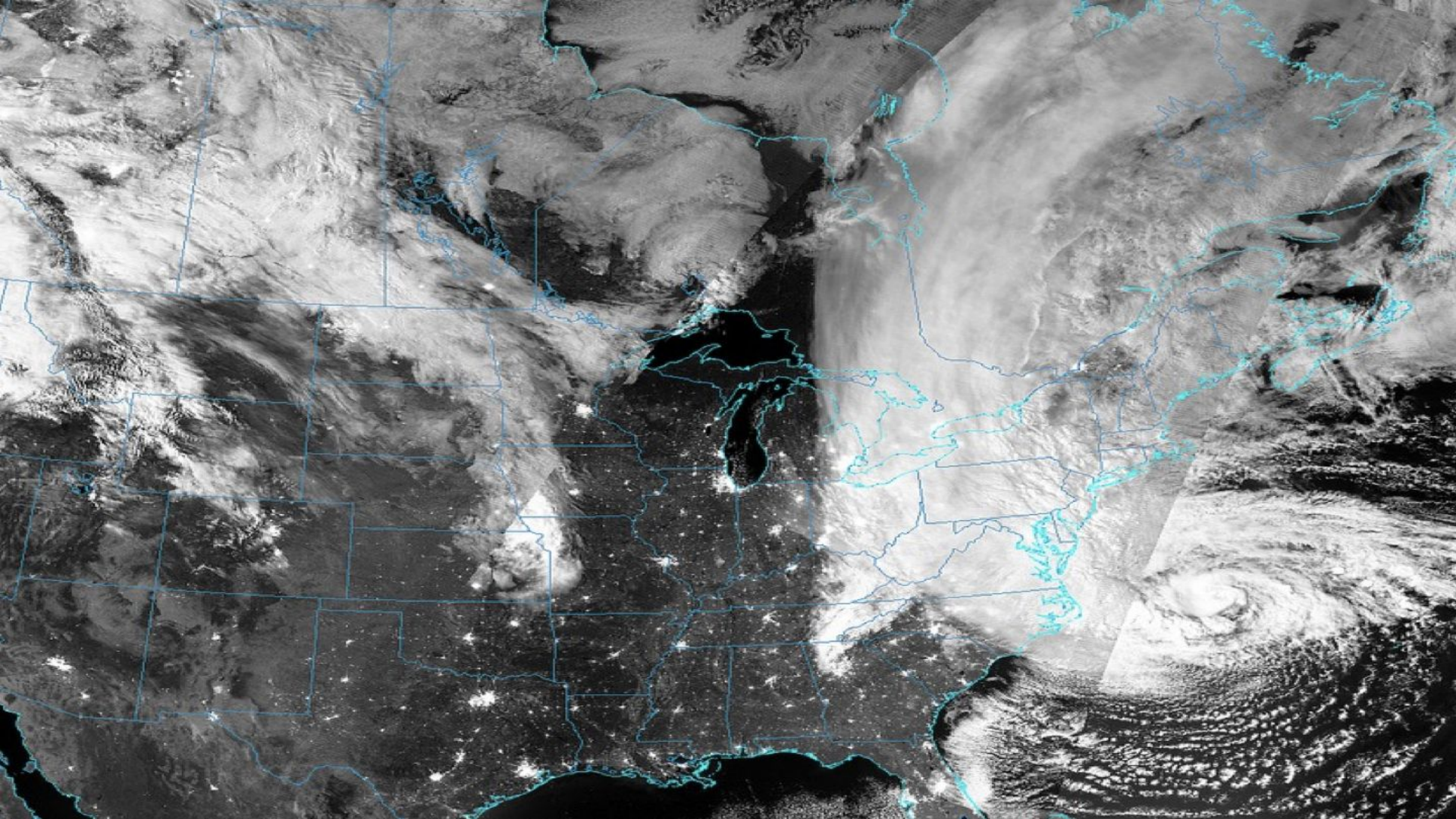


REBUILD BY DESIGN







HOT MESS



PHYSICAL



SOCIAL

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.

ASIA

2023 was Asia's 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

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.

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.

OCEANIA

Oceania had its 10th-warmest year on record.

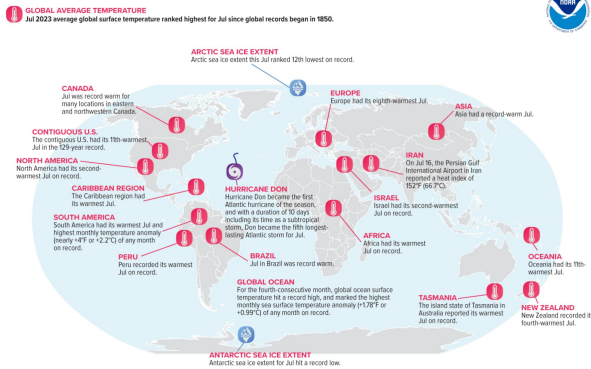
SOUTHWEST PACIFIC CYCLONE SEASON*

Below-average activity: six storms, including three cyclones

*Cyclone season runs from June 2022–July 2023

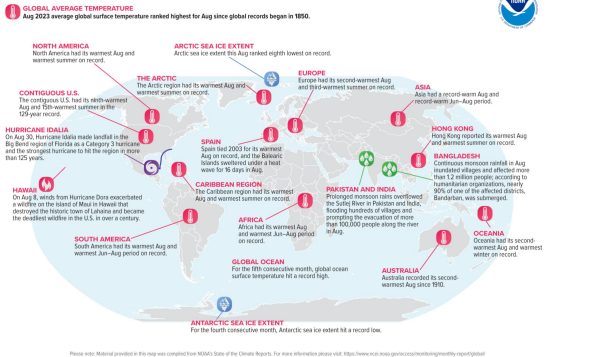
July 2023

Selected Significant Climate Anomalies and Events: July 2023



Aug 2023

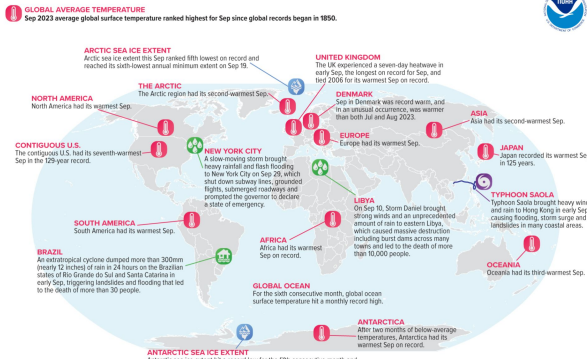
Selected Significant Climate Anomalies and Events: August 2023



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.noaa.gov/state-of-the-climate/monthly-report/globally>

Sept 2023

Selected Significant Climate Anomalies and Events: September 2023



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.noaa.gov/state-of-the-climate/monthly-report/globally>

Oct 2023

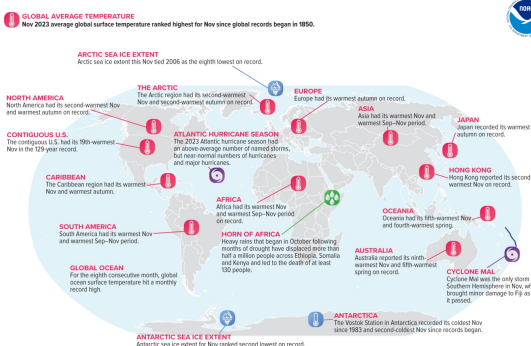
Selected Significant Climate Anomalies and Events: October 2023



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.noaa.gov/state-of-the-climate/monthly-report/globally>

Nov 2023

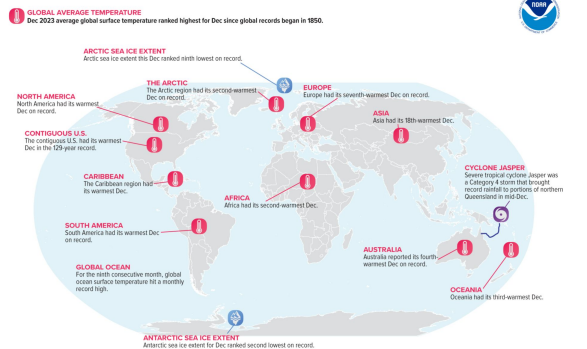
Selected Significant Climate Anomalies and Events: November 2023



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.noaa.gov/state-of-the-climate/monthly-report/globally>

Dec 2023

Selected Significant Climate Anomalies and Events: December 2023



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.noaa.gov/state-of-the-climate/monthly-report/globally>

Dictionary

Enter a word, e.g. "pie"



a·nom·a·ly

/əˈnämələ/

noun

1. something that deviates from what is standard, normal, or expected.
"there are a number of anomalies in the present system"
synonyms: oddity, peculiarity, abnormality, irregularity, inconsistency, incongruity, aberration, quirk, rarity
"the growth on the duck's bill is a harmless anomaly"
2. **ASTRONOMY**
the angular distance of a planet or satellite from its last perihelion or perigee.



Translations, word origin, and more definitions

Feedback

PLANNING AHEAD PAYS OFF

In the US, \$1 Spent on Disaster Planning
Yields \$6 in Future Benefits

- Flood Protection
- Public Health
- Property Value (Research reveals that property values increase as flood risk reduces 2% to 7%)
- Enhanced Ecology
- Cleaner Water
- Carbon Sequestration
- Reduction in stormwater runoff
- Increased recreation and tourism
- Increased aesthetics

-National Institute of Building Sciences issued *Natural Hazard Mitigation Saves: 2017 Interim Report*.

Disastrous spending: Federal disaster-relief expenditures rise amid more extreme weather

In 2011 and 2012 the United States experienced an onslaught of floods, storms, droughts, heat waves, and wildfires. We estimate that the federal government spent \$136 billion total from 2011 to 2013 on disaster relief, which adds up to nearly \$400 per household per year. These costs will continue to increase as extreme weather becomes more frequent and/or severe due to climate change. We must act now to reduce the industrial carbon pollution responsible for climate change and help communities become more resilient to extreme weather.

Funding for disaster recovery and relief for 3 major events (in billions of dollars)

Flooding in Mississippi and Missouri rivers
Disaster Supplemental Appropriations 2012



Superstorm Sandy
Disaster Supplemental Appropriations 2013



Federal spending on disaster recovery and relief by department (in billions of dollars) FY 2011–2013



**HOW SHOULD WE
PROTECT OURSELVES**

HINT: NOT LIKE THIS!

Osabe, Japan





VENICE, 1927



ADAPTATION?



Euronews

LIVING WITH WATER?

gettyimages®
AFP



acupofjoe.com





REBUILD
BY
DESIGN

TYPICAL DESIGN PROCESS

Site

Budget

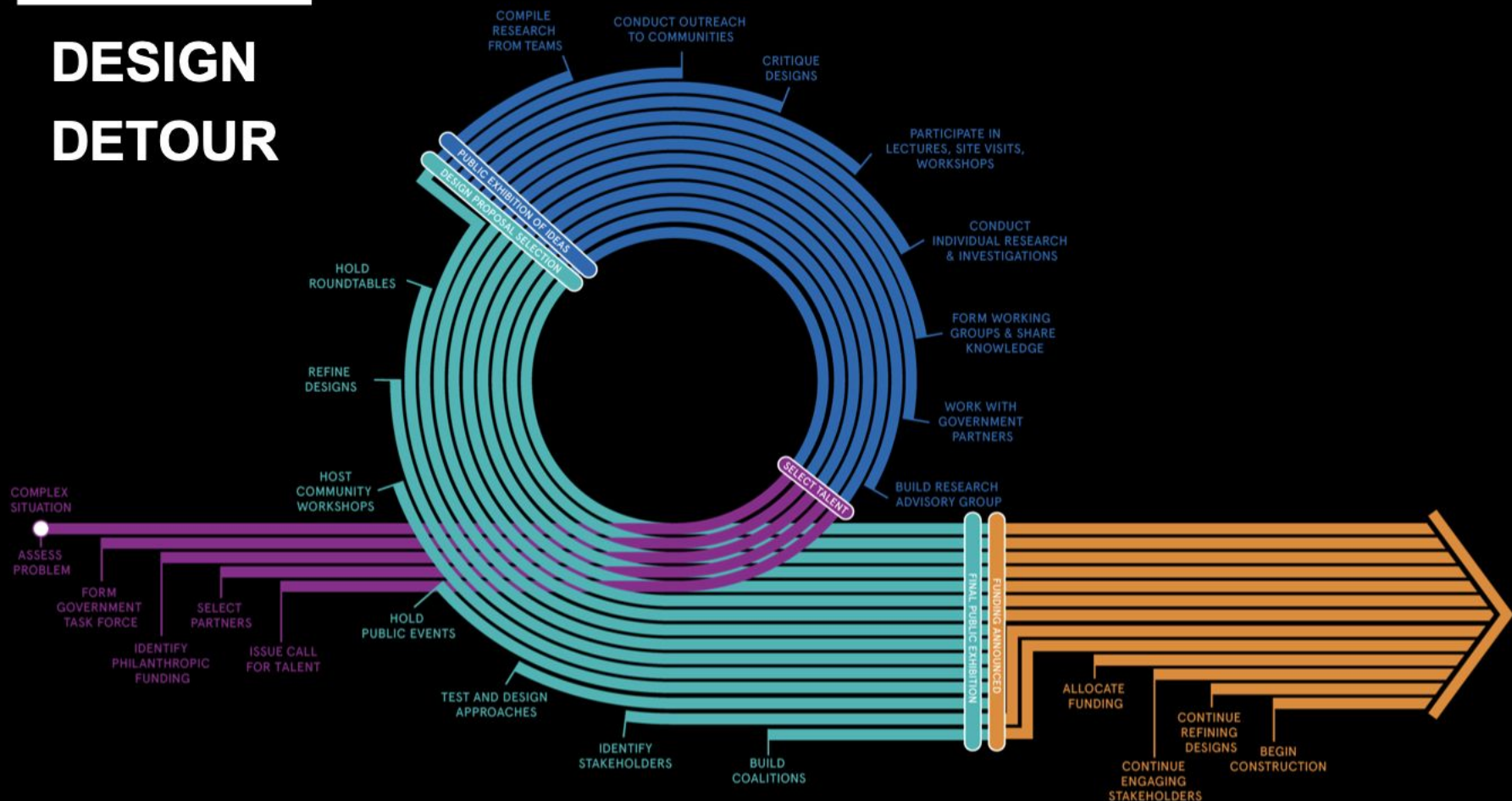
Program

Square Footage

Timeline



DESIGN DETOUR



CAN WE LEARN FROM PRODUCT DESIGN?

**“Innovation is taking two things that already exist
and putting them together in a new way”**

- Tom Freston





1979



1984

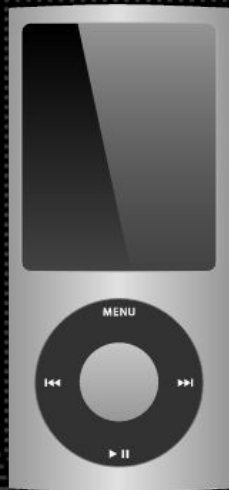
EVOLUTION OF MUSIC INNOVATION



240-
1000
Songs



1000 -
1500
Songs



1000 - 1500
Songs



2000
Songs



TODAY

Stores 43, 000 Thousands of Songs

Alarm Clock

Watch

Calendar

Camera

Courier Mail

Watch Movies and Television

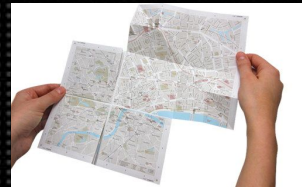
Create To-Do Lists

Map

Encyclopedia

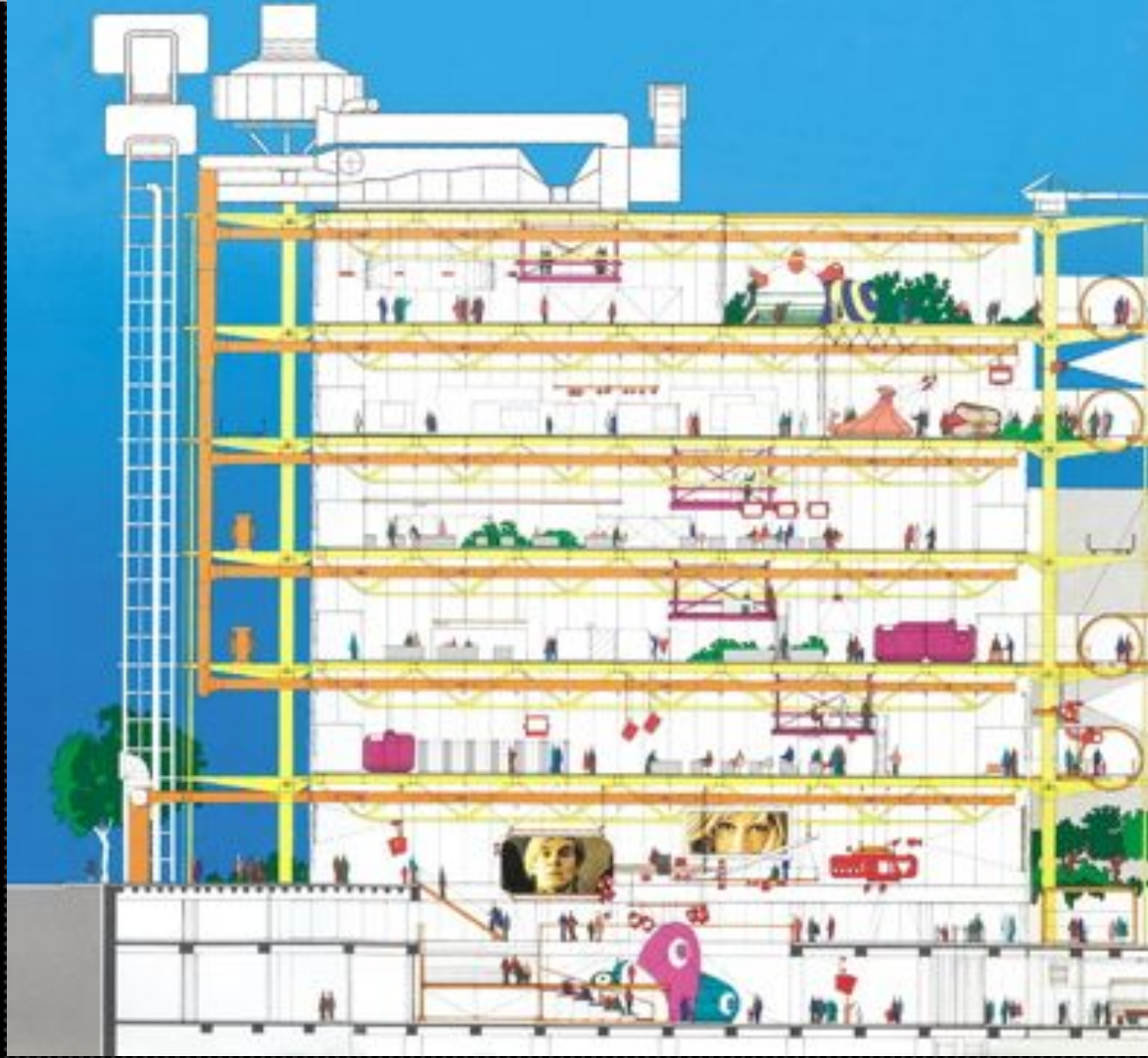
Weather

Newspaper



EXAMPLES OF MULTIBENEFIT INFRASTRUCTURE

Le Centre Pompidou



SHARED ROADS



BAHRAIN

Offices + Hotel + Energy



NETHERLANDS

Parking Garage + Flood Protection



NETHERLANDS

Parking Garage, Bike Storage, Sitting Area, Art



NETHERLANDS

Playground + Flood Protection





1.
Playground



2. **Water
Square**



3. **Rain
Storage**



4. **Ice Skating
Rink**

ROTTERDAM WATER SQUARE



BANGKOK, THAILAND

Museum + Park + Flood Protection

Resilient cities

● This article is more than 5 years old

As Bangkok sinks, could this anti-flood park be the answer?

Vast underground reservoirs beneath the city's Centenary Park can store 1m gallons of water

by [Jamie Fullerton](#) in Bangkok

Bangkok is sinking – fast. As urban development continues unabated, this city of more than 10 million people is getting lower by 2cm a year, according to Greenpeace estimates. Meanwhile, the surface of the Gulf of Thailand is rising by 4mm a year – above the global average.

With the Thai capital currently approximately 1.5 metres (5ft) above sea

Wed 3 Oct 2018 06:00 EDT



Advertisement



**4 LINES
UNLIMITED
\$25/line**

With AutoPay discount using eligible payment method. Price limits & fees.

During construction, customers on this plan may receive speeds lower

DENMARK: SKI SLOPE + POWER PLANT

thrillist

Of Course Copenhagen Has a Ski Slope Built on a Power Plant

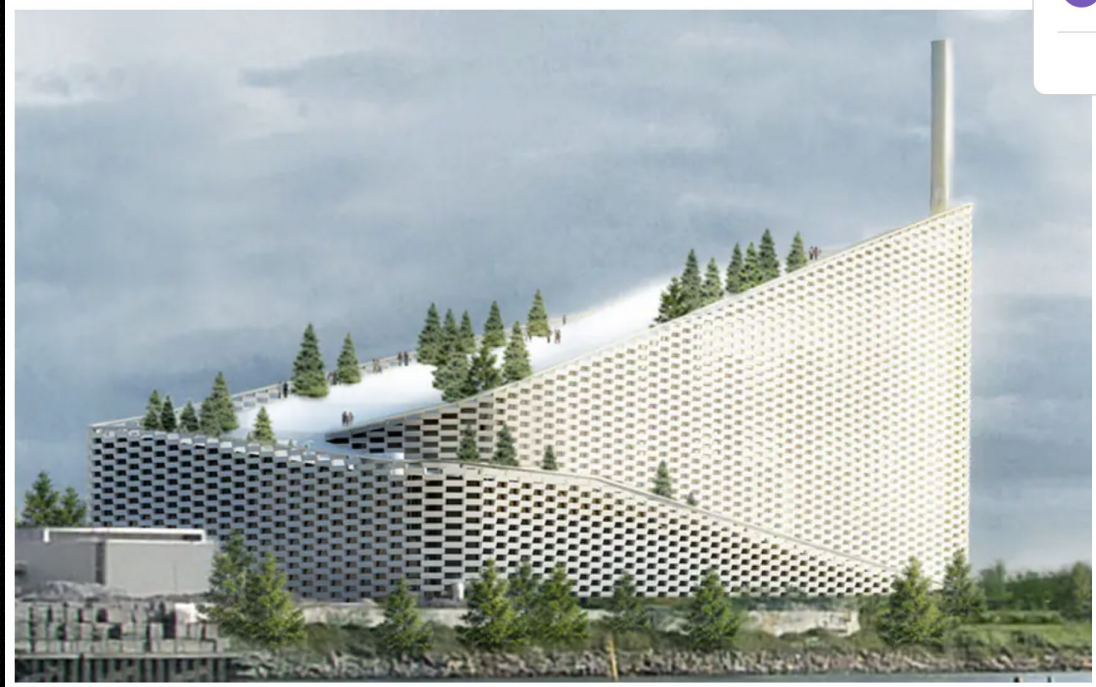
The cleanest waste-to-energy plant in the world also has a bar.

By Jessica Sulima

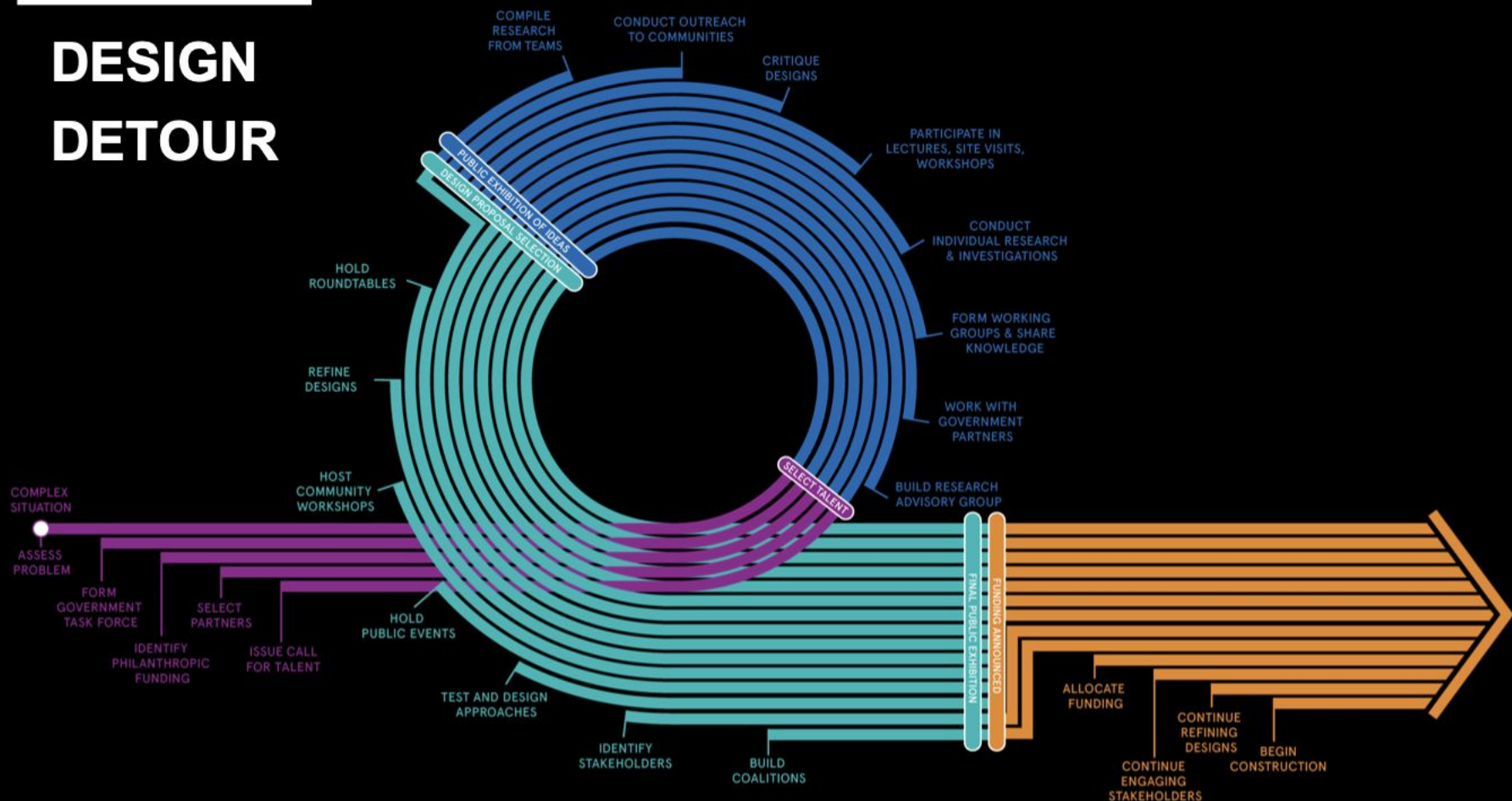
Published on 4/26/2021 at 4:29 PM



SLA



DESIGN DETOUR





COLLABORATIVE RESEARCH



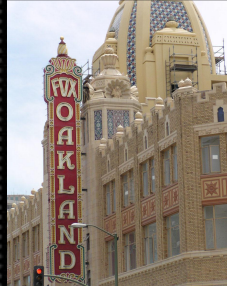
COLLABORATIVE DESIGN



LETTERS OF SUPPORT

PLACE-BASED ENGAGEMENTS THROUGHOUT THE WORLD

- **Athens:** Promoted stewardship for Lycabettus Hill
- **Atlanta, GA:** Developed a student design competition for Ted Turner Drive Resilience Corridor
- **Amman:** RBD_U program on waste, water, transportation
- **Boulder, CO:** Created a resilient and sustainable mobile home park, and later designing a collaborative process to address COVID needs
- **Boston, MA:** Proposed a citywide plan to create resilience districts
- **Juarez, MX:** Executed a design competition for Juan Gabriel Plaza
- **Los Angeles, CA:** Collaborated with stakeholders to create climate-forward building codes
- **Mexico City:** Developed a master plan framework for Xochimilco
- **Oakland, CA:** Implemented a workshop series on effective engagement
- **San Juan, PR:** Convened experts and the community for a master plan process
- **Singapore:** Promoted a community led plan to build social resilience to address flash floods





Rotterdam



Binghamton



Broome County



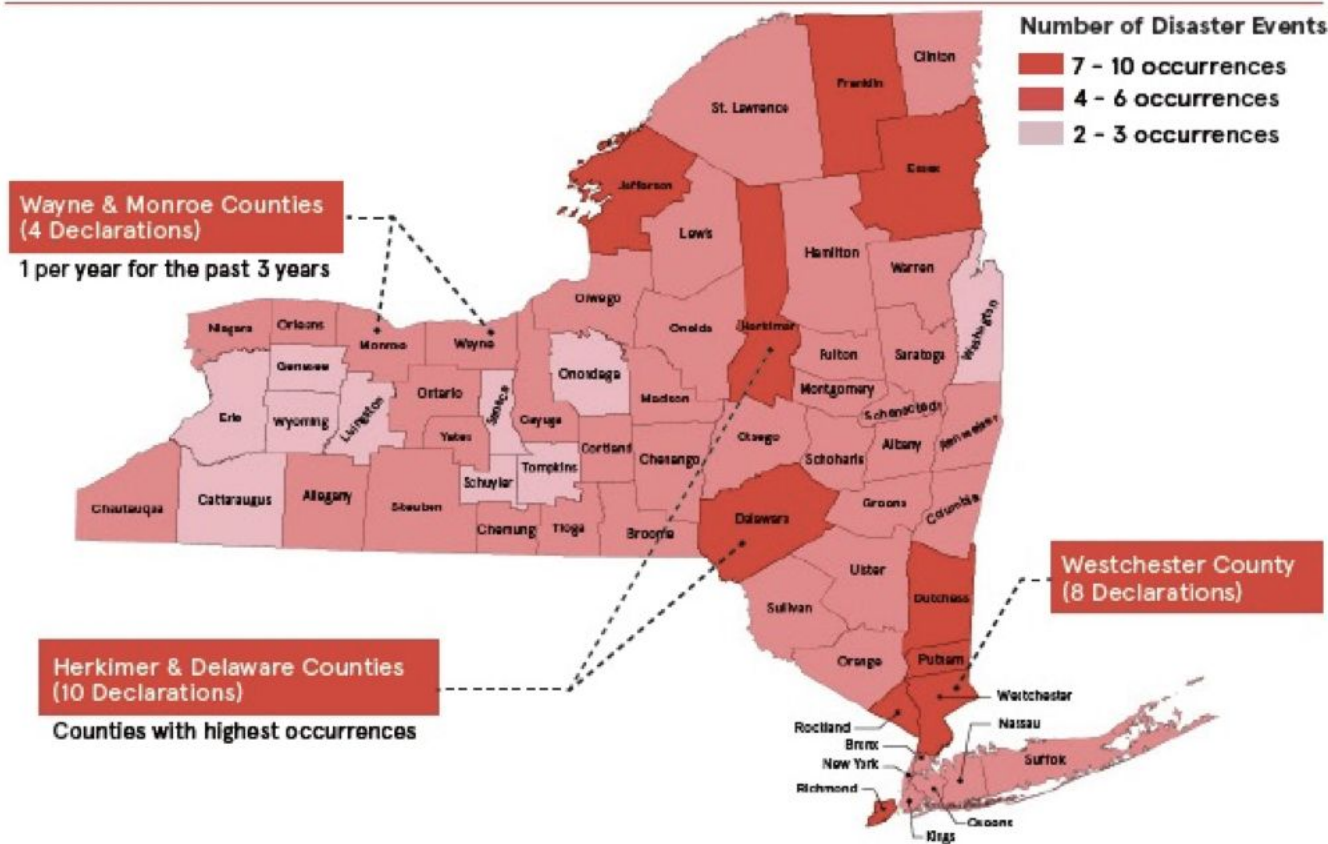
Schoharie



Pratsville

Map of Disaster Declaration Frequency in New York Counties, 2011 – 2019

REBUILD
BY
DESIGN



- 90% of New Yorkers live near a body of water
- Since 2011, every county has had at least two disasters for flooding
- 60% have had more than five

NYS ENVIRONMENTAL BOND ACT

Created the research, strategy, and coalition that led former Governor Andrew Cuomo to create the **\$3 billion** Environmental Bond Act that provides ecological restoration and flood resilience.

Governor Kathy Hochul, recognizing additional needs, recently proposed to increase the Bond Act to **\$4.2 billion**.

The Bond Act was approved by voters in **November 2022**.

NEWS

Hochul wants environmental bond to grow to \$4 billion

The massive bond act is slated to go before voters in November 2022



Rick Karlin

Sep. 21, 2021 | Updated: Sep. 21, 2021 5:21 p.m.



Set up
vaccina
testing
in days

LEARN MORE >

Cuomo pitches 'Restore Mother Nature' bond act

\$3 Billion for wetlands restoration, green energy and other plans



Rick Karlin

Jan. 8, 2020



NEW YORKERS
for Clean Water & Jobs



<https://www.thepropgallery.com/willy-wonka-original-golden-ticket/>

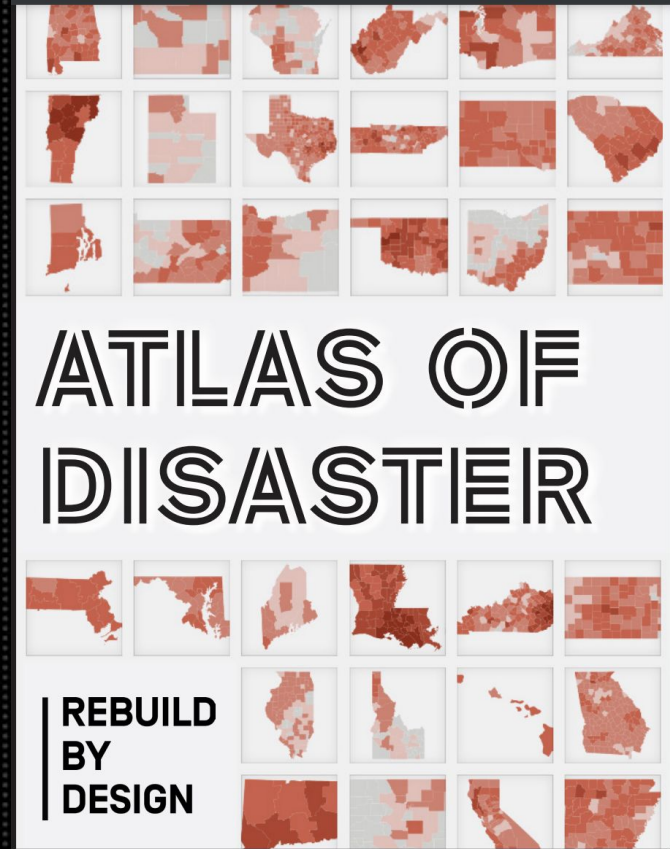
1. CLIMATE CHANGE IS HERE

2. COMMUNITIES ARE SUFFERING

3. ITS HAPPENING ON YOUR WATCH

NATIONWIDE REPORT INCLUDES

1. County-level data for the entire U.S. - over 300 maps
2. Status of current disaster and adaptation practices, and discussion of what should be changed
3. Cost of Inaction
4. Guide for States to build a Collaborative Program
5. New Finance tools
6. Cost Benefit Reform
7. Recommendations

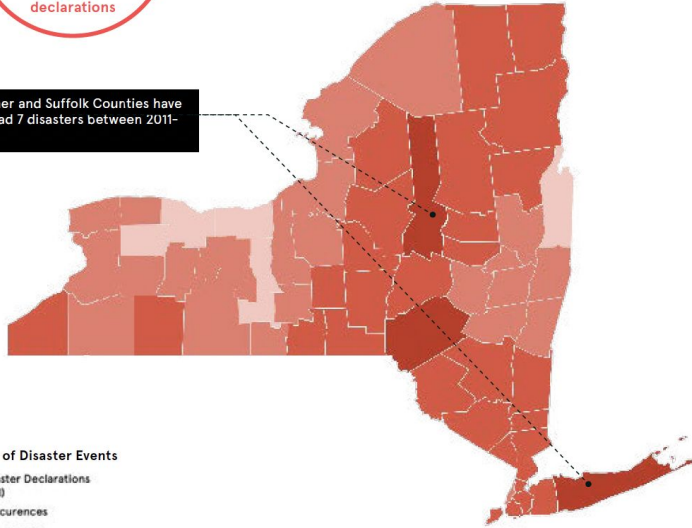


Created in partnership with APTIM and iParametrics

URBAN

16
disaster
declarations

Herkimer and Suffolk Counties have each had 7 disasters between 2011-2021.



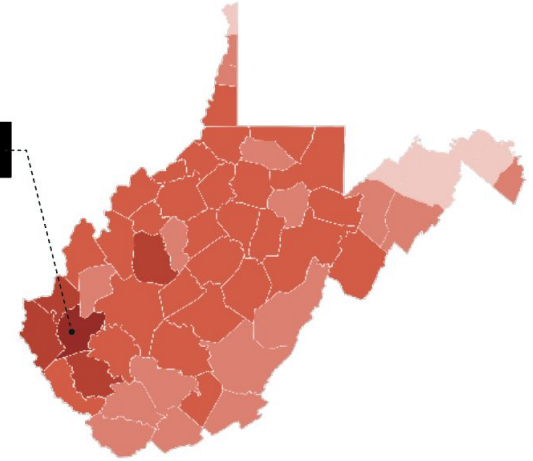
New York

RURAL

17
disaster
declarations

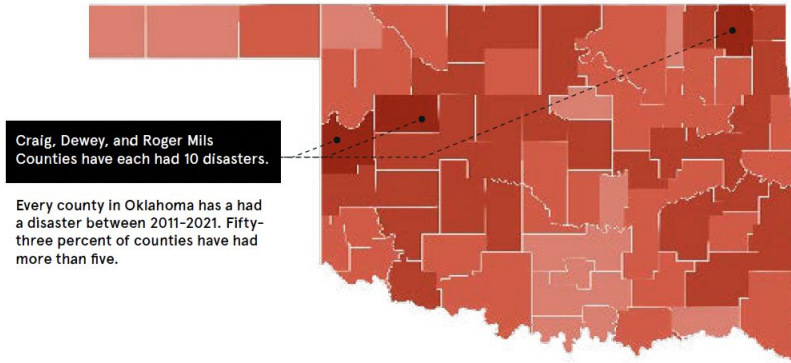
Lincoln County has had 10 disaster declarations.

Every County in West Virginia has had a recent climate disaster. Twenty-two counties have had at least five.



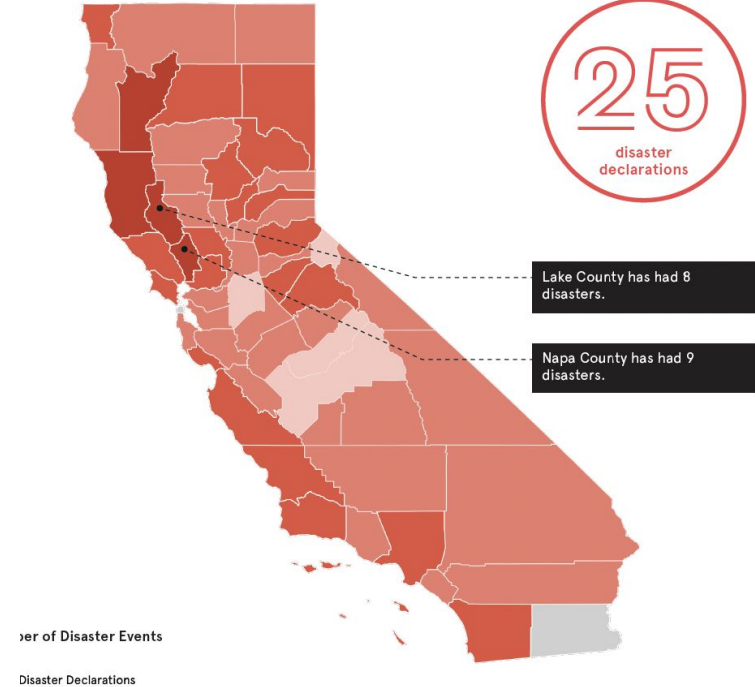
West Virginia

REPUBLICAN



Oklahoma

DEMOCRAT



California

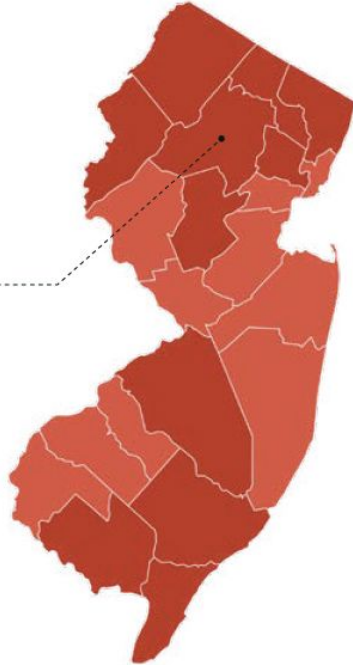
COASTAL



Morris County has had 9 recent climate disasters.

Every county in New Jersey has had at least 5 recent disasters.

Atlantic, Bergen, Burlington, Cape May, Cumberland, and Essex Counties have each had 8 disasters.



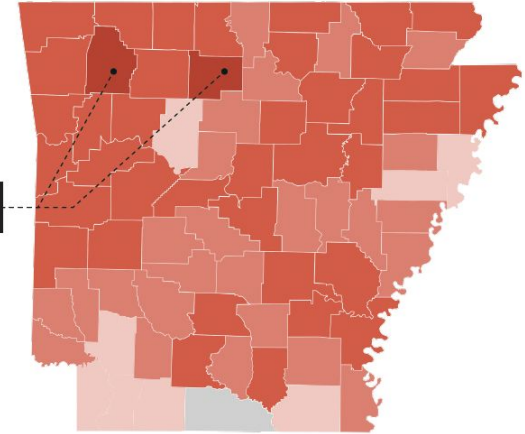
New Jersey

RIVERINE



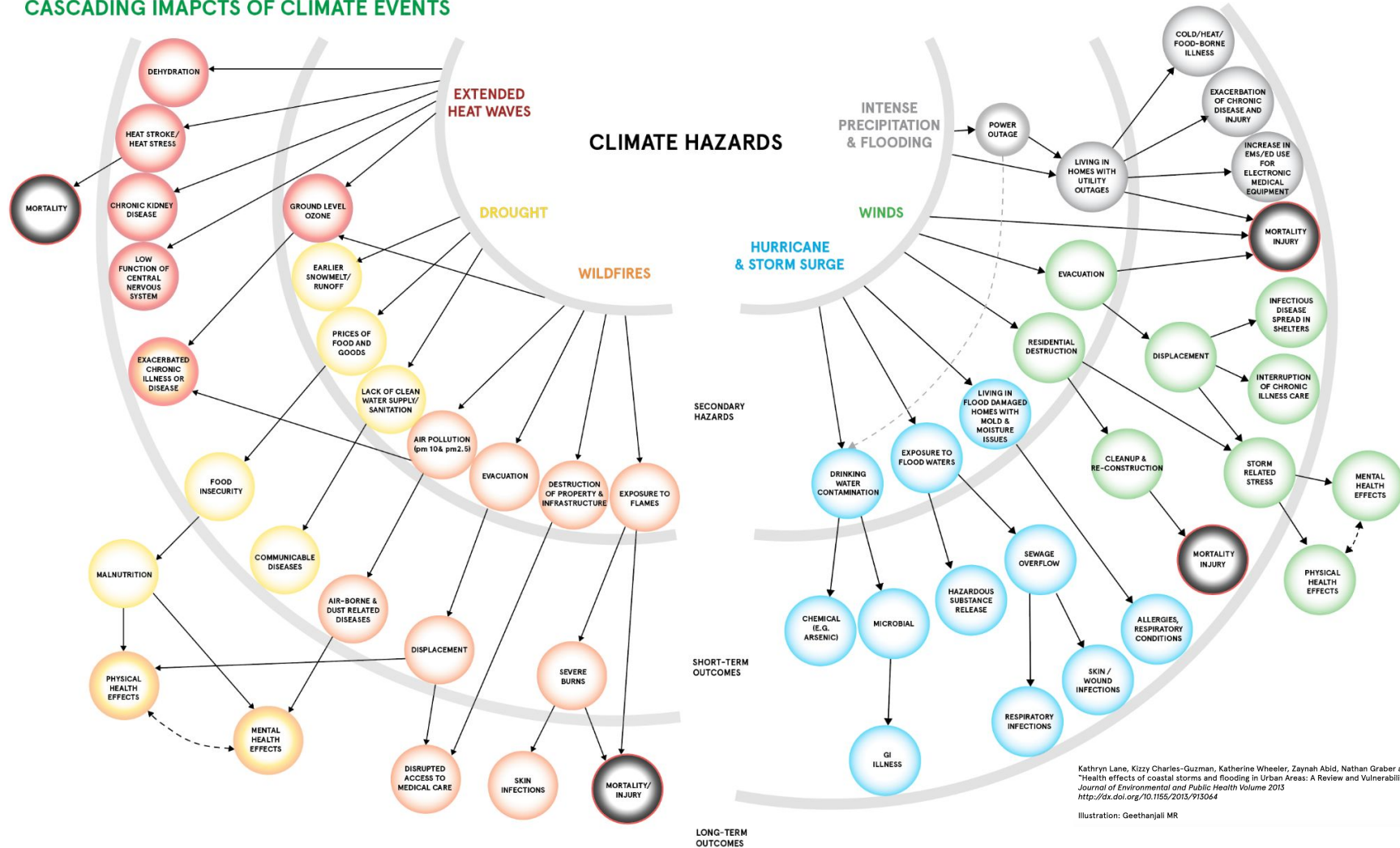
Madison and Searcy have each had 7 disasters.

18 counties have had 5 or more disasters.



Arkansas

CASCADING IMPACTS OF CLIMATE EVENTS



Kathryn Lane, Kizzy Charles-Guzman, Katherine Wheeler, Zaynah Abid, Nathan Graber and Thomas Matte, "Health effects of coastal storms and flooding in Urban Areas: A Review and Vulnerability Assessment," *Journal of Environmental and Public Health* Volume 2013 <http://dx.doi.org/10.1155/2013/913064>

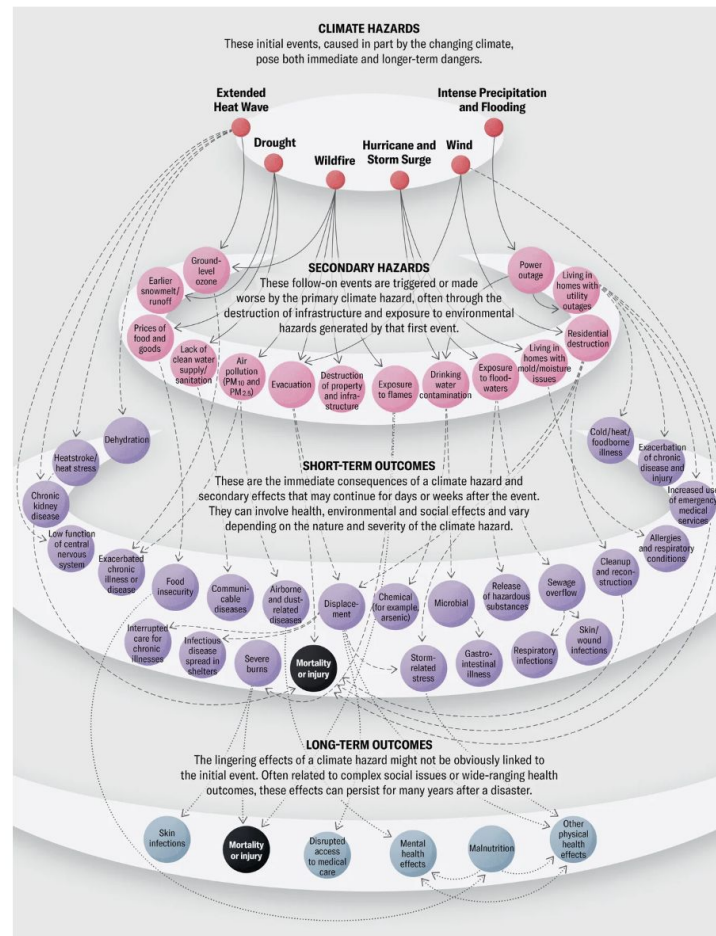
Illustration: Geethanjali MR

FEBRUARY 1, 2024 | 2 MIN READ

Visualizing Climate Disasters' Surprising Cascading Effects

See how climate disasters cause rippling effects far beyond the initial event

BY LORI YOUSHAJEKIAN & FEDERICA FRAGAPANE



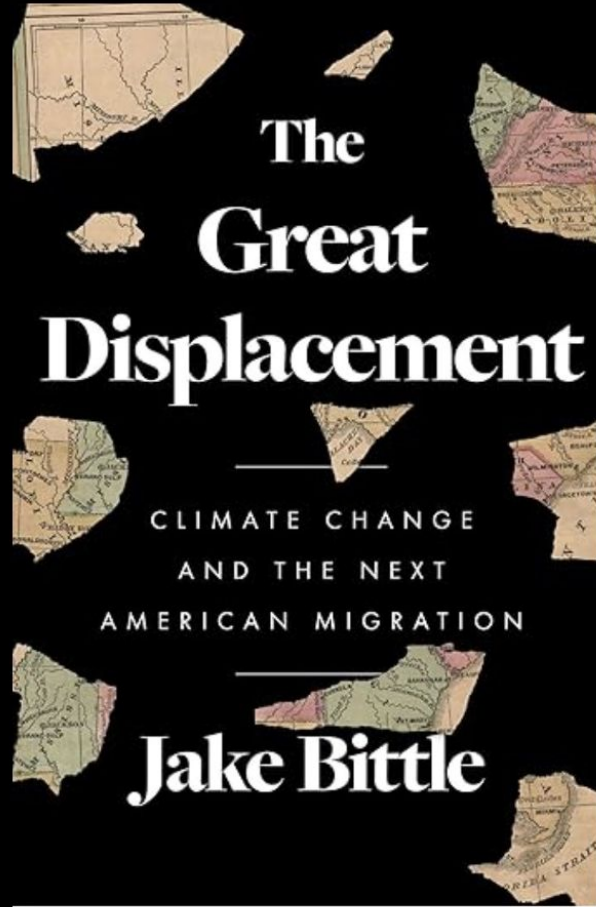
Credit: Federica Fragapane; Inspired by "Cascading Impacts of Climate Events" graphic by Geethanjali MR, in Atlas of Disaster, from Rebuild by Design; Rebuild by Design sources: Preparing for Regional Health Impacts of Climate Change in the United States, Centers for Disease Control and Prevention Climate and Health Program, July 2020; Human Health and the Climate Crisis, by Gail L. Carlson, Jones & Bartlett Learning, January 2022; "Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment," by Kathryn Lane et al., in Journal of Environmental and Public Health, Vol. 2013, <http://dx.doi.org/10.1155/2013/913064>

Feb 1, 2024

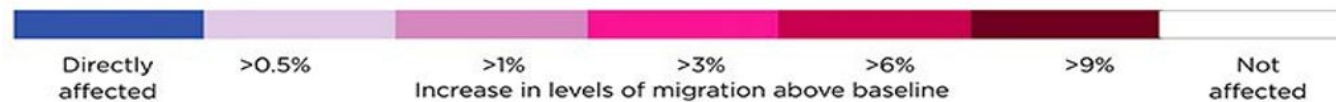
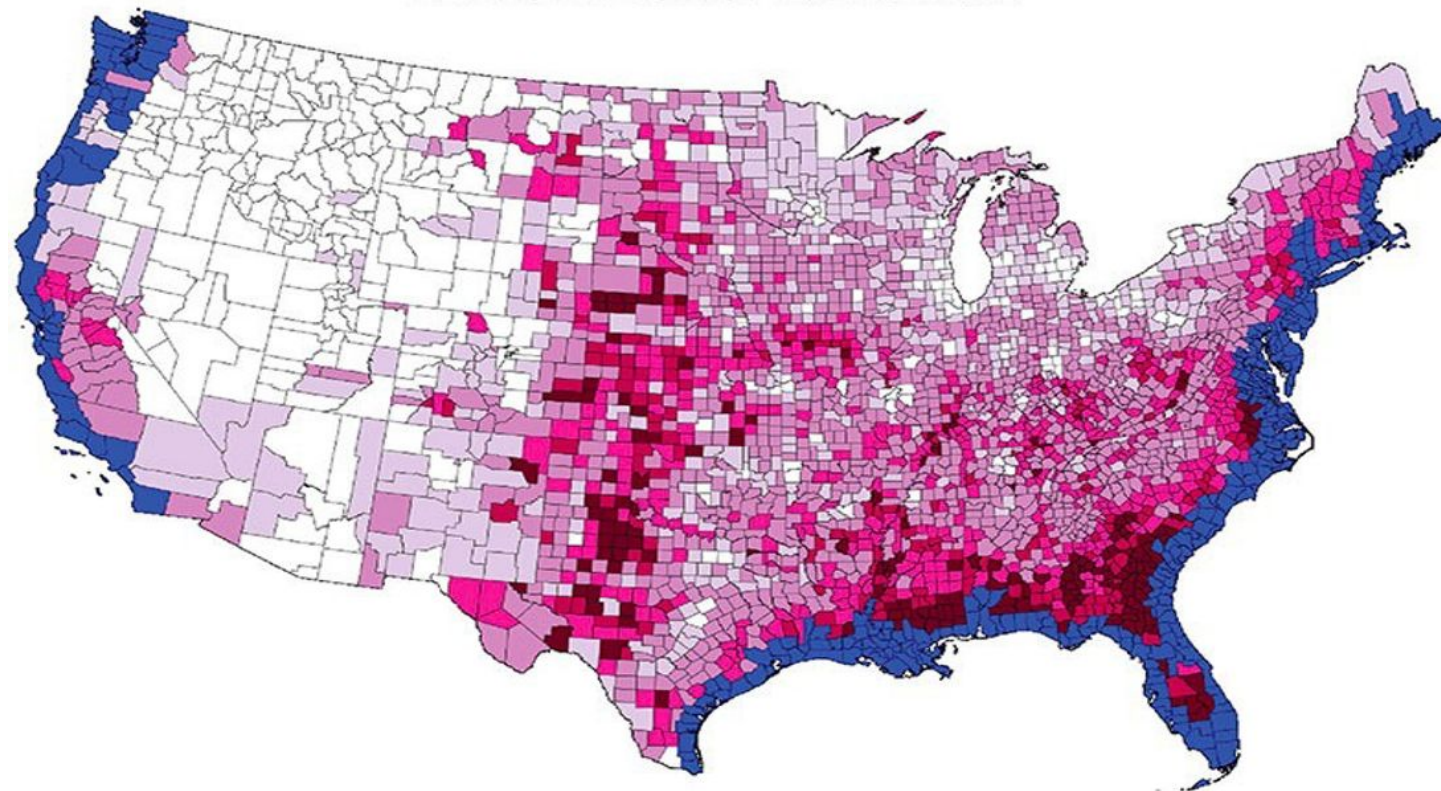
HOUSING

**MORE THAN 3 MILLION
AMERICANS LOST THEIR HOMES
TO CLIMATE DISASTERS LAST
YEAR.**

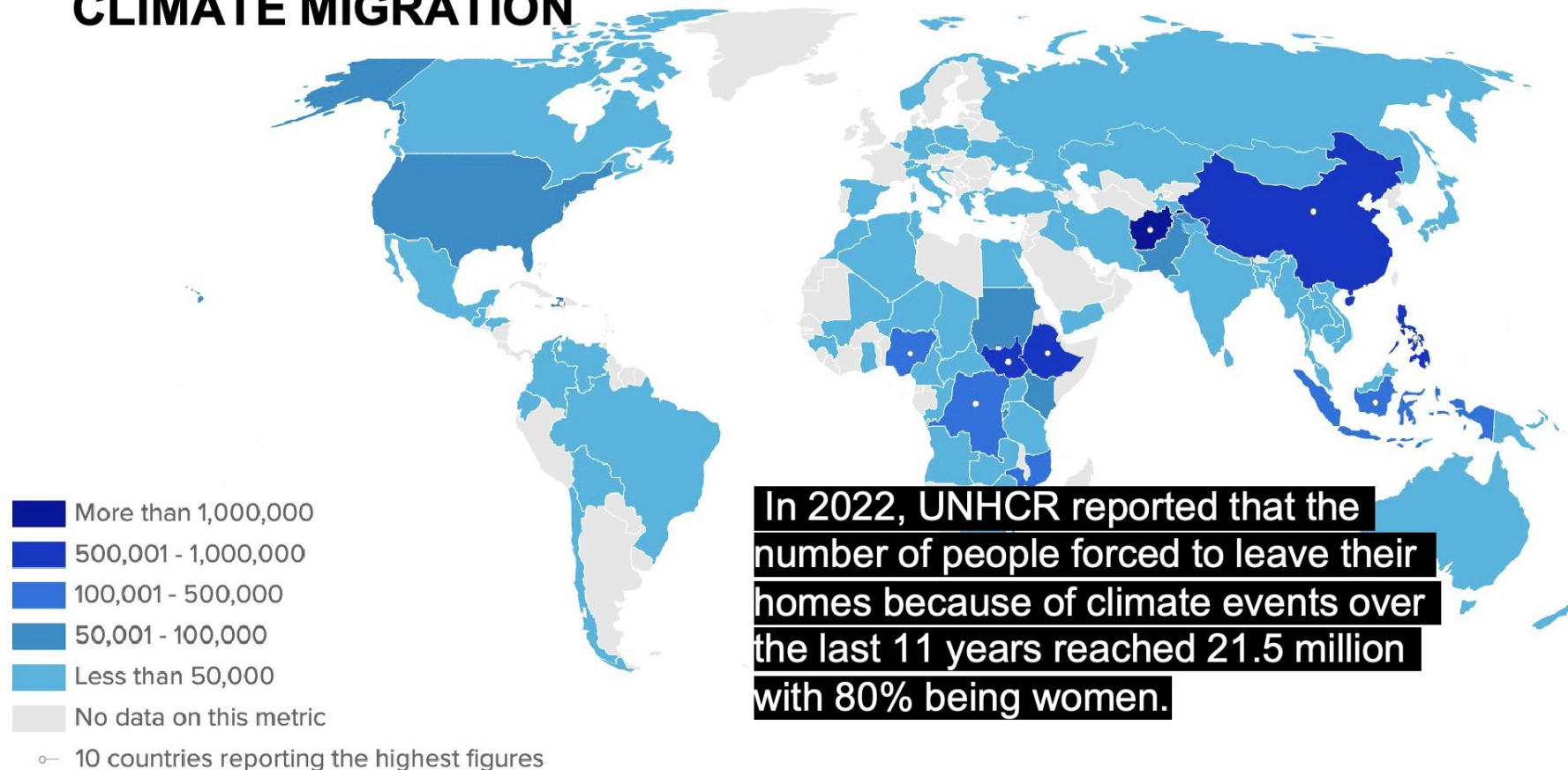
- Jake Bittle (2023)



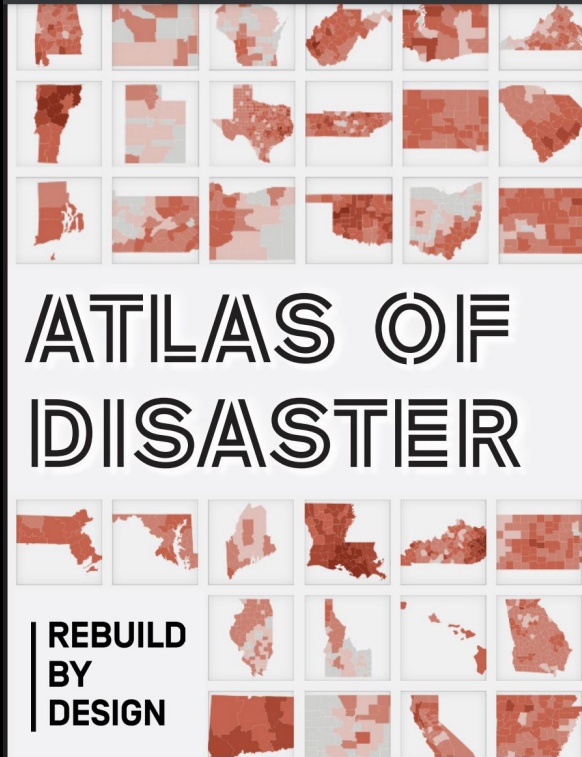
INDIRECT EFFECTS OF SEA LEVEL RISE



CLIMATE MIGRATION



**REBUILD
BY
DESIGN**



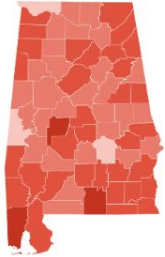
Created in partnership with APTIM and iParametrics



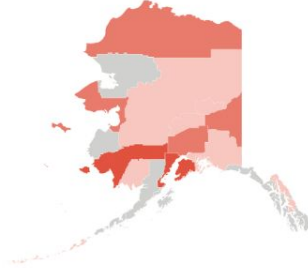
<https://bit.ly/3UXUnlQ>

STATE BY STATE RISK MAPS BY COUNTY 2011-2021

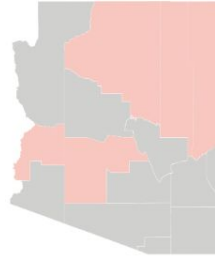
ALABAMA



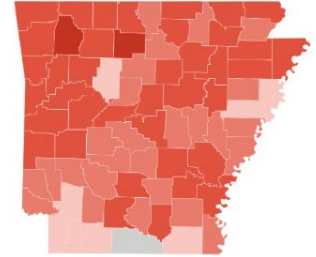
ALASKA



ARIZONA



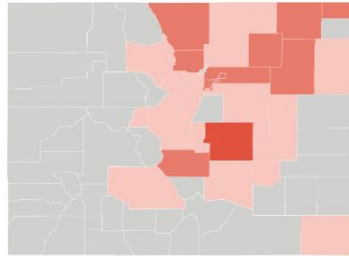
ARKANSAS



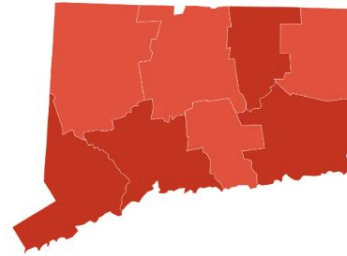
CALIFORNIA



COLORADO



CONNECTICUT

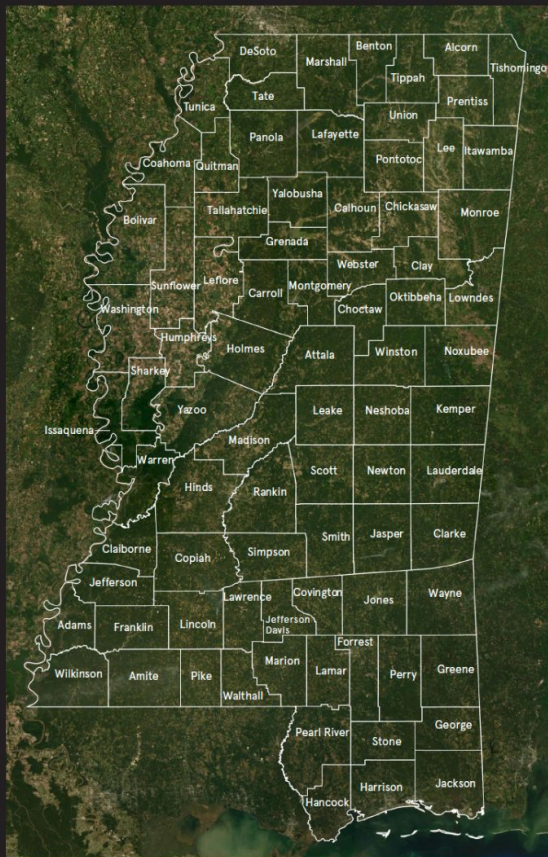


DELAWARE



Check out: RebuildByDesign.org/Atlas-of-disaster/

MISSISSIPPI



MISSISSIPPI STATISTICS SUMMARY (2011 - 2021)

22	CLIMATE DISASTER DECLARATIONS
2ND	HIGHEST NUMBER OF DISASTERS IN THE COUNTRY
EVERY	COUNTY HAS HAD A RECENT DISASTER
CLAY, HOLMES	COUNTIES WITH THE HIGHEST DISASTER OCCURENCES
54	COUNTIES WITH FIVE OR MORE DISASTERS
44	SUPERFUND SITES
D+	ASCE INFRASTRUCTURE REPORT CARD GRADE
HARRISON	HIGHEST COMPOUNDING RISKS
\$476M	FEMA + HUD POST-DISASTER FUNDING
3 MILLION	POPULATION TOTAL
\$159	PER CAPITA SPENDING ON CLIMATE DISASTERS
\$2.4 BILLION	OF CLIMATE INFRASTRUCTURE COULD BE SUPPORTED THROUGH A SMALL INSURANCE SURCHARGE

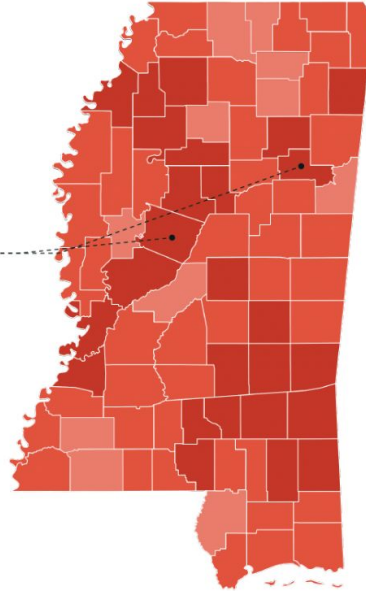
DISASTER OCCURRENCES 2011-2021

FEDERALLY DECLARED CLIMATE DISASTERS
BY COUNTY

22
disaster
declarations

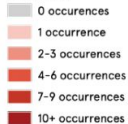
Sixty-five percent of counties in Mississippi have had five or more disasters.

Clay and Holmes counties in Mississippi have each had 9 recent disasters.



Number of Disaster Events

Major Disaster Declarations
(2011-2021)



Source: FEMA 2021
Maps courtesy of iParametrics

FEDERAL ASSISTANCE 2011-2021

POST-DISASTER PUBLIC ASSISTANCE AND HAZARD MITIGATION FUNDS
OBLIGATED BY COUNTY FOR CLIMATE DISASTERS

\$476M
post-disaster
assistance

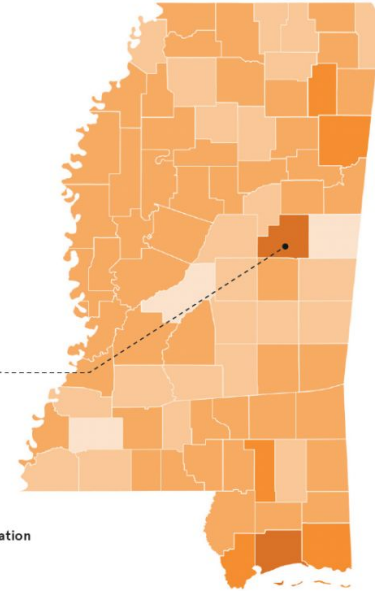
\$431M FEMA obligations

\$45.1M HUD CDBG-DR Funds

\$476 FEMA + HUD assistance

\$159 per capita cost

Winston County has received the most post-disaster federal recovery funding in the state: \$70 million.



FEMA Public Assistance and Hazard Mitigation

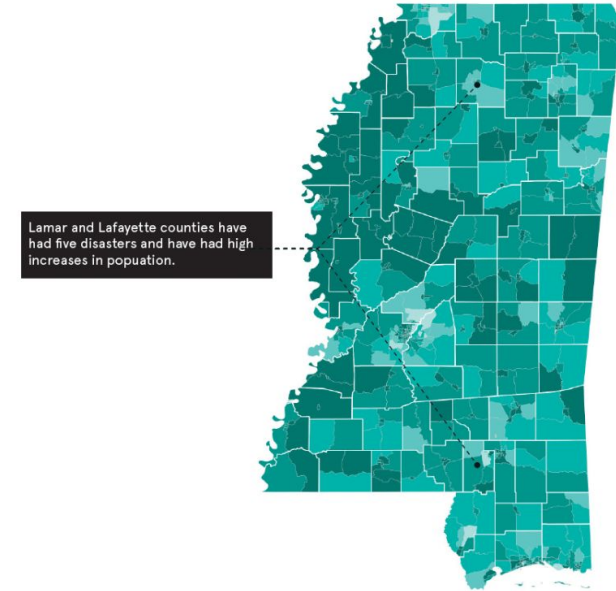
Federal Share Obligated (2011-2021)



Source: FEMA 2021
Maps courtesy of iParametrics

SOCIAL VULNERABILITY INDEX 2011-2021

AREAS OF GREATEST SOCIAL VULNERABILITY



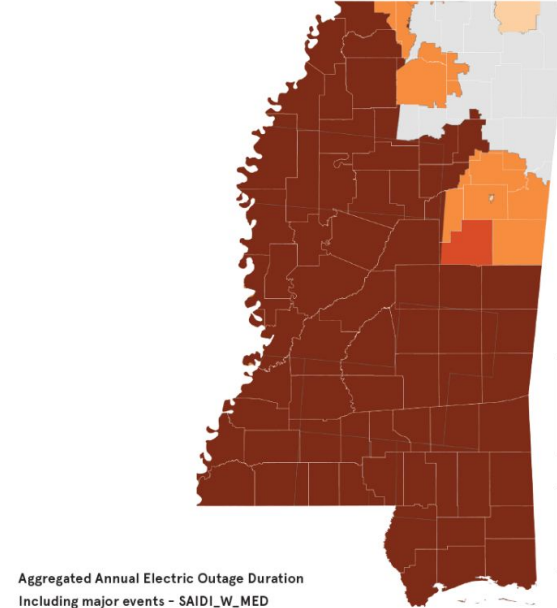
CDC (2018)

- No Value
- 0.0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0

Source: CDC/ATSDR 2018 Social Vulnerability Index
Maps courtesy of iParametrics

ENERGY RELIABILITY 2011-2021

COUNTIES AT GREATEST RISK OF POWER OUTAGES



missing electric outage data

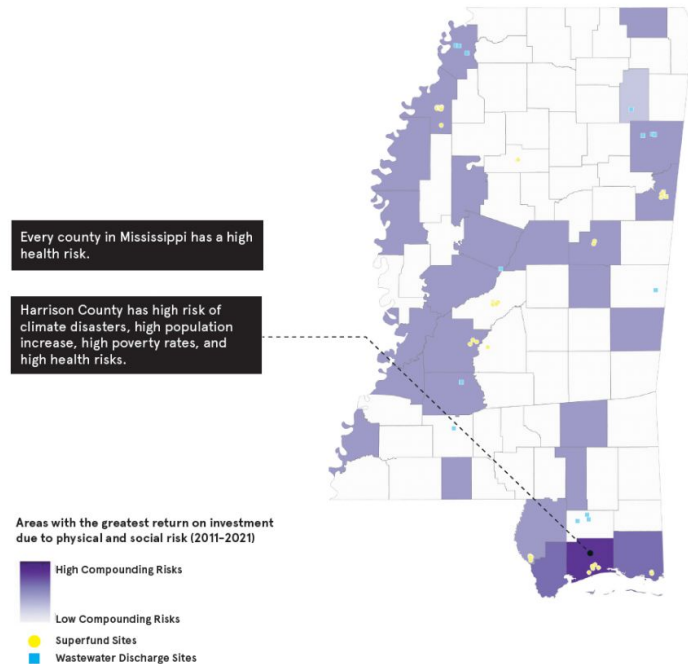
- 0 - 60 minutes
- 60 - 120 minutes
- 120 - 240 minutes
- 240 - 456 minutes
- 456 - 7,700 minutes

Source: U.S. Energy Information Administration
Maps courtesy of APTIM

A majority of the state is serviced by an energy utility company with longer than average energy outage periods.

Twenty-four counties in Mississippi have high social vulnerability and low energy reliability.

COMPOUNDING RISKS: A FRAMEWORK FOR FUTURE INVESTMENT



U.S. counties were analyzed for social benefits using the following parameters: NOAA Sea Level Rise (Source: Sea Level Rise and Coastal Flooding Impacts (noaa.gov)); Population Density (Source: 2020 Census Demographic Data Map Viewer); Population Change (Source: 2020 Census Demographic Data Map Viewer); Poverty (Source: 2020 Census Demographic Data Map Viewer); Cardiovascular Diseases (Source: US Data | GHDx (healthdata.org)); Neoplasms (Source: US Data | GHDx (healthdata.org)); Diabetes, urogenital, blood, and endocrine diseases (Source: US Data | GHDx (healthdata.org)); FEMA Natural Hazard risk (Source: Map | National Risk Index (fema.gov)) | Map courtesy of APTIM.

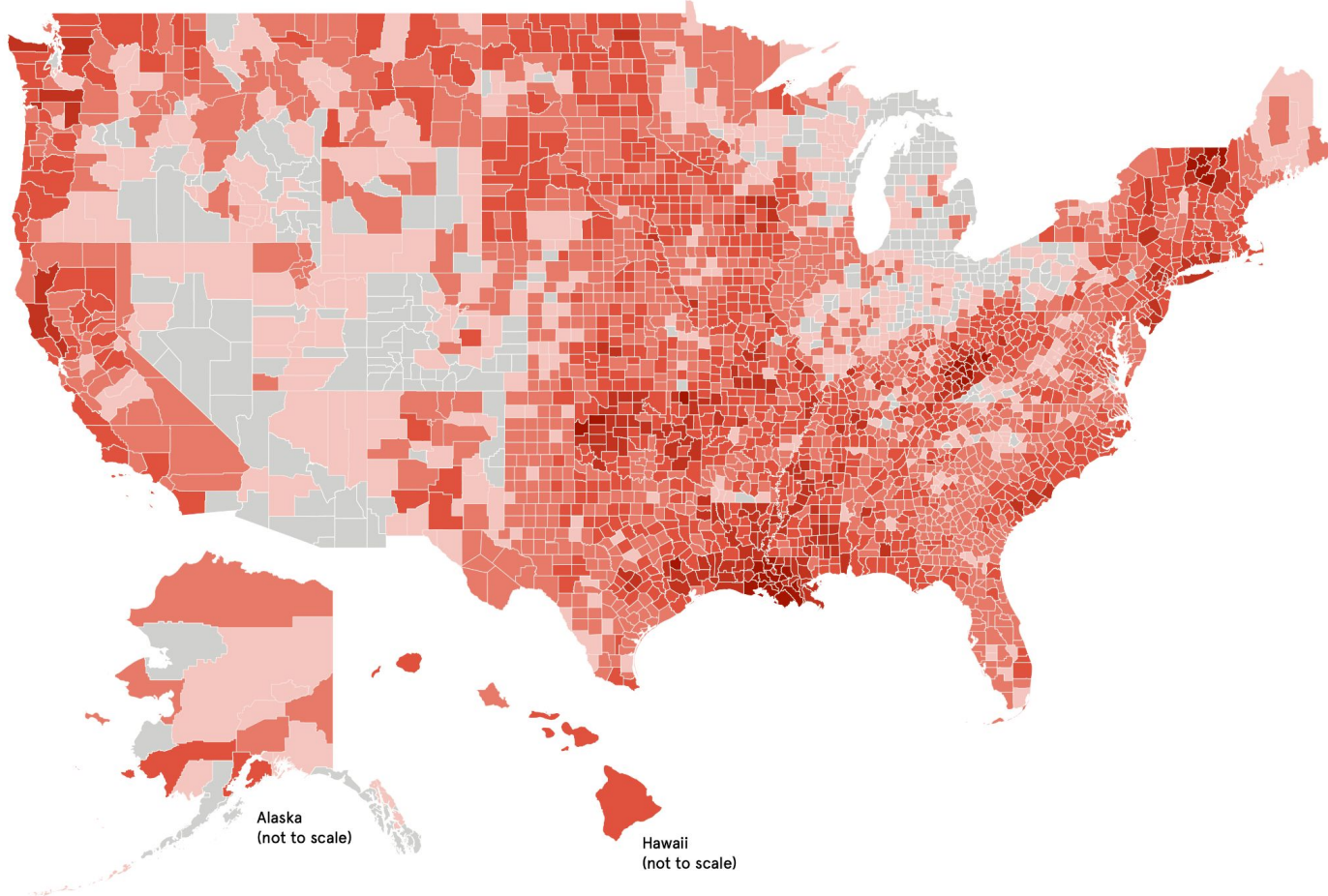
County Name	High Population Density	High Percent of Population Change	High Poverty Rate	High Health Risk	Types of High Climate Risk	Sea Level	Total Risk Count
Adams					1		3
Alcorn					1		3
Amite							0
Attala					1		3
Benton							0
Bolivar					2		3
Calhoun							0
Carroll							0
Chickasaw							0
Choctaw							0
Claiborne					1		3
Clarke							0
Clay							0
Coahoma					2		3
Copiah					2		3
Covington							0
DeSoto							0
Forrest					2		3
Franklin							0
George							0
Greene							0
Grenada							0
Hancock					1		4
Harrison					4		5
Hinds					7		3
Holmes					1		3
Humphreys							0
Issaquena							0
Itawamba							0
Jackson					1		4
Jasper							0
Jefferson							0
Jefferson Davis							0
Jones					2		3
Kemper							0
Lafayette							0
Lamar							0
Lauderdale					3		3
Lawrence							0
Leake							0
Lee					1		2
Leflore					3		3
Lincoln							0
Lowndes					1		3
Madison							0
Marion							0
Marshall							0
Monroe					2		3
Montgomery							0

TOTAL: 22 DISASTERS
FEMA PA + HM: \$431 M
HUD CDBG-DR: \$45.1 M
FEMA + HUD ASSISTANCE: \$476 M

[illegible]

TOTAL: 22 DISASTERS FEMA PA + HM: \$431 M HUD CDBG-DR: \$45.1 M FEMA + HUD ASSISTANCE: \$476 M			2011				2012		2013	
			1972: SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND ASSOCIATED FLOODING		1983: FLOODING		4081: HURRICANE ISAAC		4101: SEVERE STORMS, TORNADOES, AND FLOODING	
County Name	# of Climate Disasters 2011- 2021	Total FEMA Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations
Statewide	22	\$109,877,869	\$6,993,818	\$157,841	\$4,115,298	\$83,758	\$12,033,008	\$40,536	\$962,433	\$12,363
Adams County	5	\$1,661,207			\$393,399	\$0	\$112,849	\$74,969		
Alcorn County	4	\$6,177,717	\$141,975	\$0						
Amite County	3	\$149,989					\$149,989	\$0		
Attala County	5	\$163,106	\$0	\$0			\$0	\$0		
Benton County	3	\$779,511	\$195,583	\$0						
Bolivar County	5	\$912,590			\$146,022	\$0				
Calhoun County	5	\$353,660	\$82,861	\$0						
Carroll County	7	\$1,939,110	\$60,023	\$0			\$0	\$32,322		
Chickasaw County	7	\$1,812,910	\$672,585	\$27,774						
Choctaw County	6	\$549,526	\$397,859	\$0						
Claiborne County	8	\$2,735,037			\$46,303	\$0	\$170,095	\$0		
Clarke County	7	\$1,243,692	\$99,664	\$83,300			\$221,129	\$0		
Clay County	9	\$895,582	\$351,388	\$0						
Coahoma County	7	\$2,217,116	\$0	\$0	\$120,375	\$0				
Copiah County	4	\$230,936					\$108,725	\$0		
Covington County	8	\$5,750,950					\$117,304	\$0		
DeSoto County	4	\$239,861	\$130,994	\$0	\$0	\$0				

U.S. DISASTER OCCURRENCES 2011-2021





**90% of counties in the
U.S. have had a federal
disaster declaration due
to extreme weather
between 2011-2021.**

Alaska
(not to scale)

Hawaii
(not to scale)

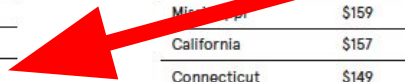
DISASTER OCCURRENCES

HIGHEST DISASTER STATES		HIGHEST DISASTER STATES	
STATES	TOTAL DISASTERS	STATES	TOTAL DISASTERS
California	25	Virginia	11
Mississippi	22	Florida	11
Oklahoma	22	Georgia	11
Iowa	21	Minnesota	11
Tennessee	20	Connecticut	10
Louisiana	18	Hawaii	10
Alabama	17	Maryland	10
Texas	17	New Mexico	10
Vermont	17	Wisconsin	10
West Virginia	17	Delaware	9
Arkansas	16	Idaho	9
New Hampshire	16	Massachusetts	9
New York	16	Pennsylvania	9
Washington	16	South Carolina	8
Alaska	15	Colorado	7
North Carolina	15	Utah	7
Nebraska	14	Maine	6
Missouri	13	Michigan	6
Kansas	13	Ohio	6
New Jersey	13	Arizona	5
North Dakota	13	West Virginia	5
South Dakota	13	Indiana	4
Kentucky	12	Rhode Island	4
Montana	12	Wyoming	4
Oregon	12	Nevada	3

PER CAPITA FEMA + HUD SPENDING

HIGHEST COST PER CAPITA		HIGHEST COST PER CAPITA	
STATES	PER CAPITA	STATES	PER CAPITA
Louisiana	\$1,736	New Mexico	\$97
New York	\$1,348	Arkansas	\$81
New Jersey	\$815	Massachusetts	\$73
North Dakota	\$738	Georgia	\$64
Vermont	\$593	Montana	\$63
Texas	\$518	Kansas	\$60
West Virginia	\$461	New Hampshire	\$55
Alaska	\$401	Rhode Island	\$53
Florida	\$390	Minnesota	\$49
Nebraska	\$390	Pennsylvania	\$49
South Carolina	\$289	Virginia	\$49
Alabama	\$275	Maryland	\$39
South Dakota	\$269	Washington	\$36
North Carolina	\$243	Wyoming	\$32
Hawaii	\$229	Idaho	\$32
Iowa	\$228	Wisconsin	\$27
Oklahoma	\$215	Delaware	\$14
Oregon	\$210	Utah	\$11
Missouri	\$182	Nevada	\$11
Mississippi	\$159	Indiana	\$7
California	\$157	Arizona	\$2
Connecticut	\$149		
Colorado	\$141		
Kentucky	\$105		
Tennessee	\$97		

Highest Heat Deaths in the U.S.



OVERLOOKING THE DEADLIEST RISK: EXTREME HEAT

"One reason we pay so little attention to heat waves is that American disaster policy is designed to insure property, not to promote human health or protect life."

—Eric Klinenberg

Extreme heat is the number one weather-related cause of death in the U.S.,¹ and yet it has never been the cause of a federal Disaster Declaration.² According to an analysis of provisional mortality data collected by the Centers for Disease Control and Prevention (CDC), heat was a contributing factor in 1,577 U.S. deaths in 2021 – a 56 percent jump from 1,012 in 2018.³ It is estimated that about 800 people died in Washington and British Columbia as a result of record-breaking hot temperatures in neighborhoods that lacked the infrastructure to cool its residents.⁴ Heat wave frequency and duration has risen steadily from an average of two heat waves per year during the 1960s to six per year during the 2010s and 2020s,⁵ with the last eight years being the hottest on record.⁶

In addition to being linked to growing mortality rates, extreme heat can lead to a number of negative health impacts such as heat stroke and kidney failure (see p. 12). According to the Center for Disease Control (CDC), older adults, infants and children, those with chronic conditions, lower-income individuals, athletes, outdoor workers, and pregnant women are disproportionately affected by increased heat.⁷ Urban areas have additional challenges due to dense concentrations of concrete and pavement instead of natural areas, known as the "urban heat island effect." Urban centers can be up to 10-15°C higher than in their rural surroundings.⁸ Within cities, areas with less green space, often BIPOC or low-income communities are likely to experience

greater exposure to extreme heat, with higher rates of adverse outcomes.⁹

Increased and prolonged heat events also have economic impacts. Under baseline climate conditions, the U.S. could lose an average of approximately \$100 billion annually from heat-induced lost labor productivity, which could double to nearly \$200 billion by 2030 and reach \$500 billion by 2050.¹⁰ This includes loss of agriculture due to lower labor productivity and lower crop yields.

Federal Disaster Declaration data does not reflect the severity of extreme heat occurrences, because these events do not cause major property damage – a threshold to determine a federal Disaster Declaration. Heat primarily causes damage to physical bodies, resulting in loss of life or labor. For example, Nevada, the state with the lowest number of disaster occurrences, and Arizona, ranked 40th in disaster occurrences for the last decade (see p. 654), have the highest deaths from heat illnesses from 2018-2021. In those four years, heat has been among the causes of death for 571 people in Nevada and 1,298 people in Arizona.¹¹ That's 4.54 and 4.46 deaths per 100,000 residents respectively – compared to the U.S. average of 0.35 per 100,000 residents over the same period. Additionally, it should be noted that deaths caused by extreme heat are likely undercounted, as there are no comprehensive mechanisms for healthcare providers to track or report heat-related deaths. Often, mortality data ascribes the cause of death to an underlying health condition or cascading effect (such as wildfires and droughts), not to the extreme heat event which exacerbated conditions.

Climate mitigation efforts through carbon reduction targets are essential to slowing the rate at which

global temperatures are rising; however, these efforts must be coupled with heat adaptation investments to protect people now from the temperature thresholds we've already surpassed. Further, additional policy changes are needed to the way governments and scientists communicate heat risk. Recently, California became the first state to rank heat waves, as is the practice for other extreme climate events such as hurricanes, so its residents understand their exposure to this deadly risk. Globally, Seville, Spain, became the first city to implement a heat wave naming and categorization system to better communicate risk¹² and enable the government to respond with effective and appropriate heat risk reduction interventions. Athens followed with a similar pilot project focusing on the most vulnerable populations.¹³

As we move toward investing in climate infrastructure, we can integrate heat infrastructure along with flood infrastructure by building nature-based solutions to simultaneously reduce flood risk to communities and reduce the urban heat island effect. The U.S. must prioritize local investments to lower extreme temperatures. Cooling stations, increased tree canopy, and investments in green roofs are examples of mitigation measures that can lower extreme heat. Building heat adaptation should also be folded into existing energy-upgrades of the building sector, as all mitigation efforts can be most effective through mitigation/adaptation combined initiatives. However, until heat is understood to have equally severe effects as other weather-related disasters, governments will continue to underinvest in heat hazard mitigation.

AIR TEMPERATURE ON JULY 13, 2022

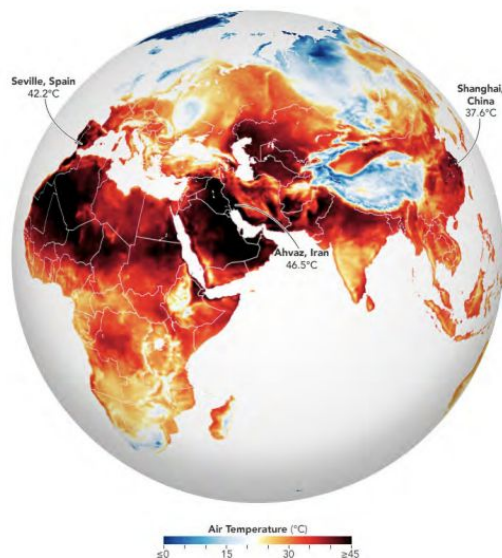
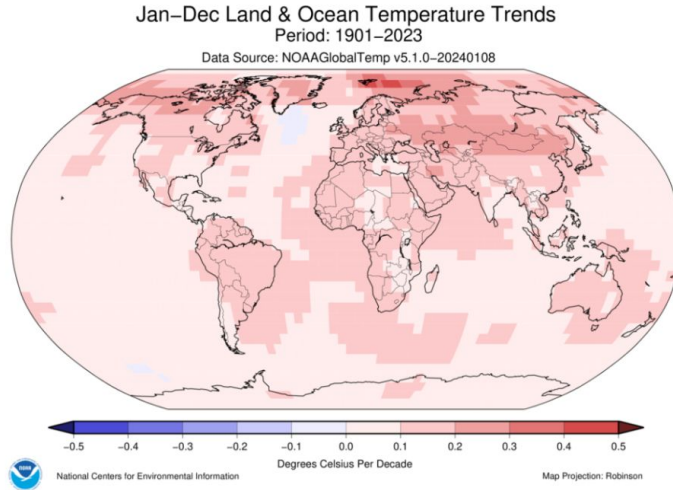
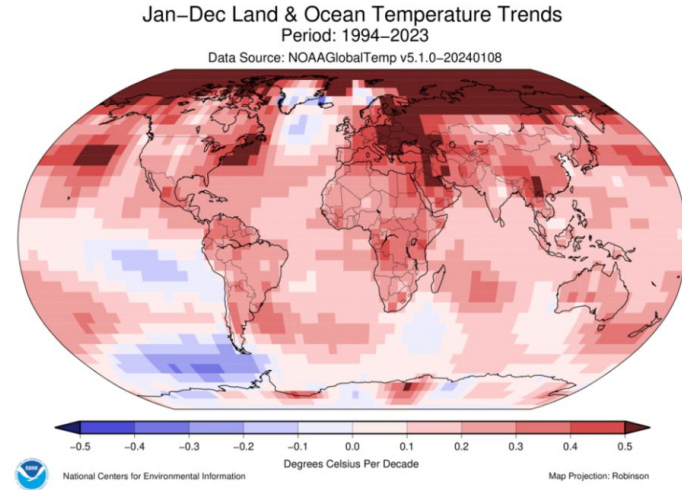


IMAGE: NASA EARTH OBSERVATORY

There is a 45% chance that 2024 will be the warmest year in NOAA's 175-year record and a 99% chance it will rank in the top five. (NOAA)



[Temperature trends since 1901](#)



[Temperature trends since 1994](#)

NOAA National Centers for Environmental Information, Monthly Global Climate Report for Annual 2023, published online January 2024, retrieved on March 16, 2024 from <https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202313/supplemental/page-3>.



THIS IS AN OPPORTUNITY

**We can reimagine our communities with
infrastructure that makes our
communities better than they are
today...**

MULTI PURPOSE INFRASTRUCTURE CAN:

- >> Increase health and mental health outcomes.
- >> Design new recreational space to decrease cardiovascular disease.
- >> Use green infrastructure to decrease temperature that Leads To Heat Stroke, and pollution that leads to asthma.
- >> Design whatever we want.

...and we are already doing it.

HURRICANE SANDY DESIGN COMPETITION JUNE 2013 – JUNE 2014

- 10 Interdisciplinary Teams
- Northeast United States
- Federal Disaster Dollars (CDBG-DR) to be awarded by HUD
- Focus on the Future, Not Returning to the Past
- Infrastructure should address multiple goals at the same time
- Judged on Innovation, Collaboration and Implementation

**JILD
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Lead Supporter
The Rockefeller Foundation

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Deutsche Bank
Hearst Foundation
The JPB Foundation
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In collaboration with
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New York University
Municipal Art Society of New York
Regional Play Association
Var Alen Institute

Design Teams

BIG Team
BIG.L

HR&A Advisors w/ Cooper, Robertson & Partners
The Commercial Corridor Resiliency Project

Interboro Team
Living with the Bay: a Comprehensive Regional Resiliency Plan for Nassau County's South Shore

MIT CAU + ZUS + URBANISTEN
New Meadowlands: Productive City + Regional Park

OMA
Resist, Delay, Store, Discharge: a comprehensive strategy for Hoboken

PennDesign / OLIN
Hunts Point Lifelines

Sasaki / Rutgers / Arup
Resilience + The Beach

SCAPE / Landscape Architecture
LIVING BREAKWATERS

WB unabridged with Yale ACADIS
Resilient Bridgeport

WXY / WEST 8
Blue Dunes - The Future of Coastal Resiliency

Build by Design
Transforming the region and its future

4

Talent by

RESEARCH ADVISORY GROUP
Eric Schilling, Chair
Philip A. Black
Vicki Chabot
Phyllis C. Johnson
Gerald D. Long
Michael L. Rabinowitz
Michael R. Rabinowitz
Michael R. Rabinowitz
Michael R. Rabinowitz
Michael R. Rabinowitz

Final projects will be selected
and on four key components:
Length of the research and
analysis, demonstration of a
participatory design process and
stakeholder coalition; design
innovation and excellence;
and impact of the proposed
design solution, as well as its
implementation strategy.

**REBUILD
BY
DESIGN**

HURRICANE SANDY COMPETITION: \$4.3 Billion in Seven multi-benefit Projects

NEW YORK CITY:

- **\$335M:** The BIG U in Manhattan, NY
- **\$20M:** Lifelines in Hunts Point, Bronx, NY

NEW JERSEY:

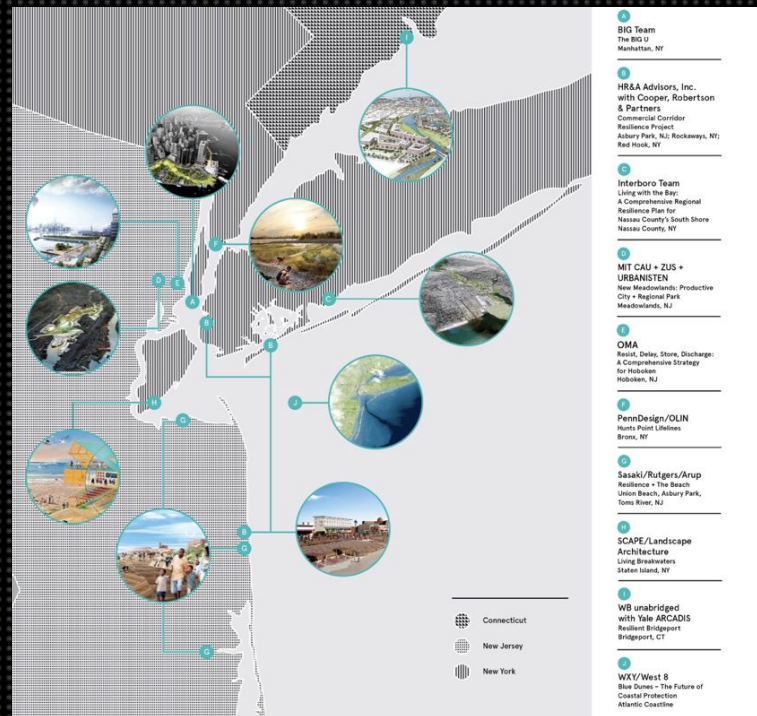
- **\$230M:** Resist, Delay, Store, Discharge in Hoboken, Weehawken, Jersey City, NJ
- **\$150M:** New Meadowlands in Little Ferry, Moonachie, Carlstadt, Teterboro, NJ

NEW YORK STATE:

- **\$125M** Living with the Bay in Nassau County, Long Island
- **\$60M:** Living Breakwaters in Tottenville, Staten Island, NY

CONNECTICUT

- **\$10M:** Resilient Bridgeport in Bridgeport, CT



An aerial photograph of Lower Manhattan, New York City, showing a dense grid of skyscrapers. A large, yellow, 'U' shaped area is highlighted, representing a proposed park or green space. This area follows the coastline of the city, starting from the Hudson River on the left, curving around the tip of the island, and ending at the East River on the right. The highlighted area includes various green spaces, walkways, and some existing structures. The surrounding city is in grayscale, emphasizing the proposed green area.

THE BIG U

Lower Manhattan

UNDER CONSTRUCTION

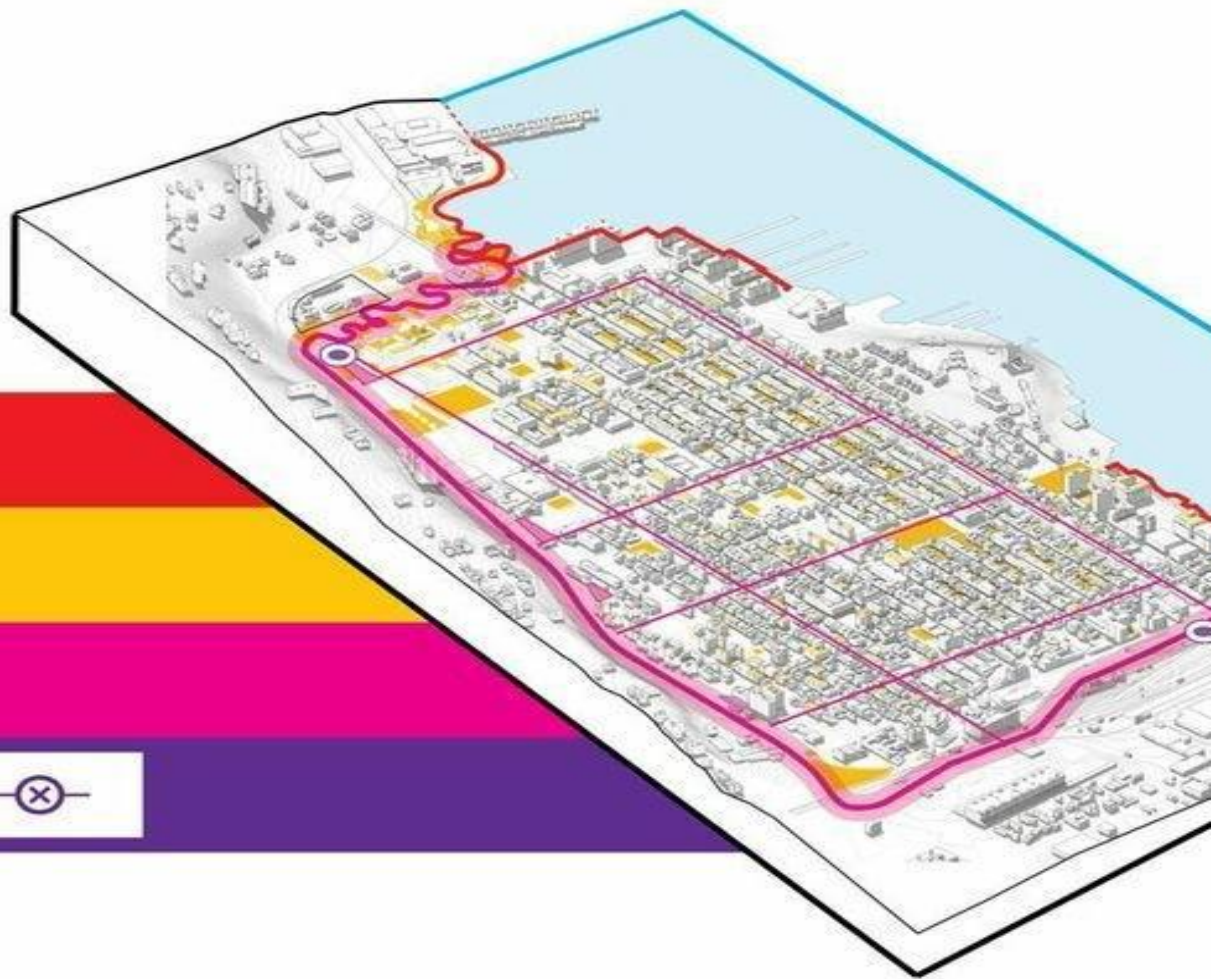
LIVING BREAKWATERS

STATEN ISLAND + RARITAN BAY
HUD REBUILD BY DESIGN



UNDER CONSTRUCTION

HOBOKEN, NJ



RESIST 

DELAY 

STORE 

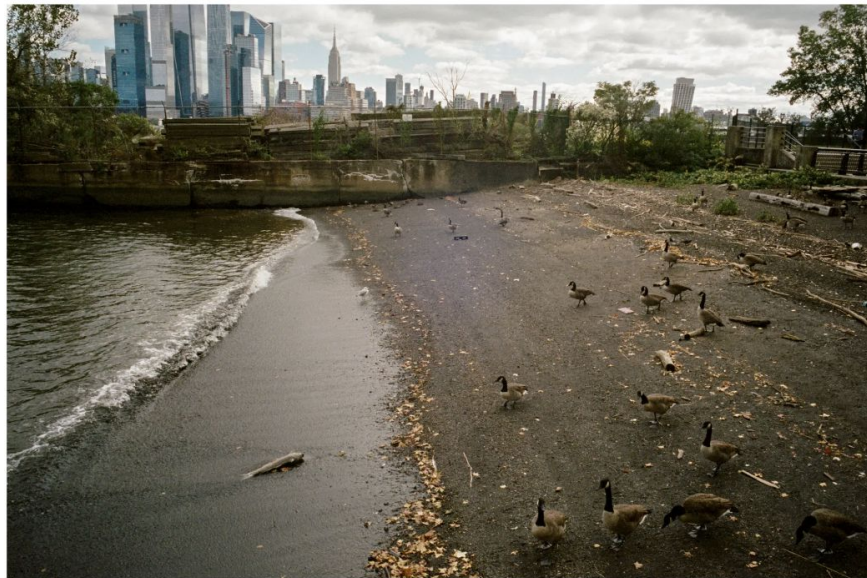
DISCHARGE 

The New York Times

A Climate Change Success Story? Look at Hoboken

This flood-prone city on the Hudson River balances climate infrastructure with resident needs.

 Share free access



When high tide and a lot of rain come at once, as they did in late September, it can overwhelm low-lying Hoboken. Daniel Arnold for The New York Times



By Michael Kimmelman

Jan. 29, 2024

CLIMATE CHANGE ~~IS COMING~~

CLIMATE CHANGE IS HERE.

Amy Chester
achester@rebuildbydesign.org



<https://bit.ly/3UXUnlQ>