NEVADA

NEVADA STATISTICS SUMMARY (2011 – 2021)	
3	CLIMATE DISASTER DECLARATIONS
LOWEST	NUMBER OF CLIMATE DISASTERS IN THE COUNTRY
3RD LOWEST	PER CAPITA SPENDING ON CLIMATE DISASTERS
DOUGLAS, STOREY, WASHOE, CARSON CITY	COUNTIES WITH THE HIGHEST DISASTER OCCURENCES
8	COUNTIES HAVE HAD DISASTER DECLARATIONS
C	ASCE INFRASTRUCTURE REPORT CARD GRADE
NYE	HIGHEST COMPOUNDING RISKS
$34 MILLIOM	FEMA + HUD POST-DISASTER FUNDING
3 MILLION	POPULATION TOTAL
$11	PER CAPITA SPENDING ON CLIMATE DISASTERS
$2.6	OF CLIMATE INFRASTRUCTURE COULD BE SUPPORTED THROUGH A SMALL INSURANCE SURCHARGE

DISASTER OCCURRENCES 2011–2021

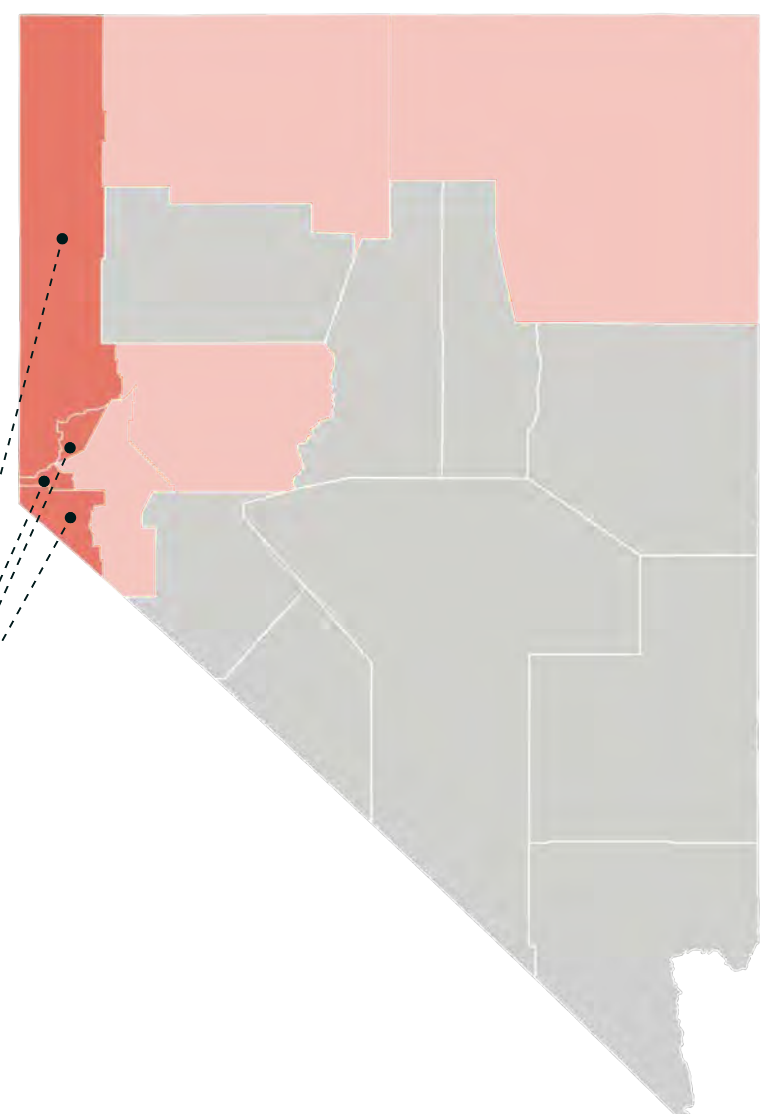
FEDERALLY DECLARED CLIMATE DISASTERS BY COUNTY

3
disaster declarations

Though Nevada appears to have low federal disaster occurrences, between 2018 and 2021, 571 people in Nevada died where heat was among the causes of death.

Eight out of 17 counties in Nevada have had disaster declarations.

Douglas, Storey, Washoe, and Carson City counties have each had two disaster declarations.



Number of Disaster Events

Major Disaster Declarations (2011–2021)

- 0 occurences
- 1 occurrence
- 2–3 occurences
- 4–6 occurrences
- 7–9 occurrences
- 10+ occurrences

Source: FEMA 2021
Maps courtesy of iParametrics

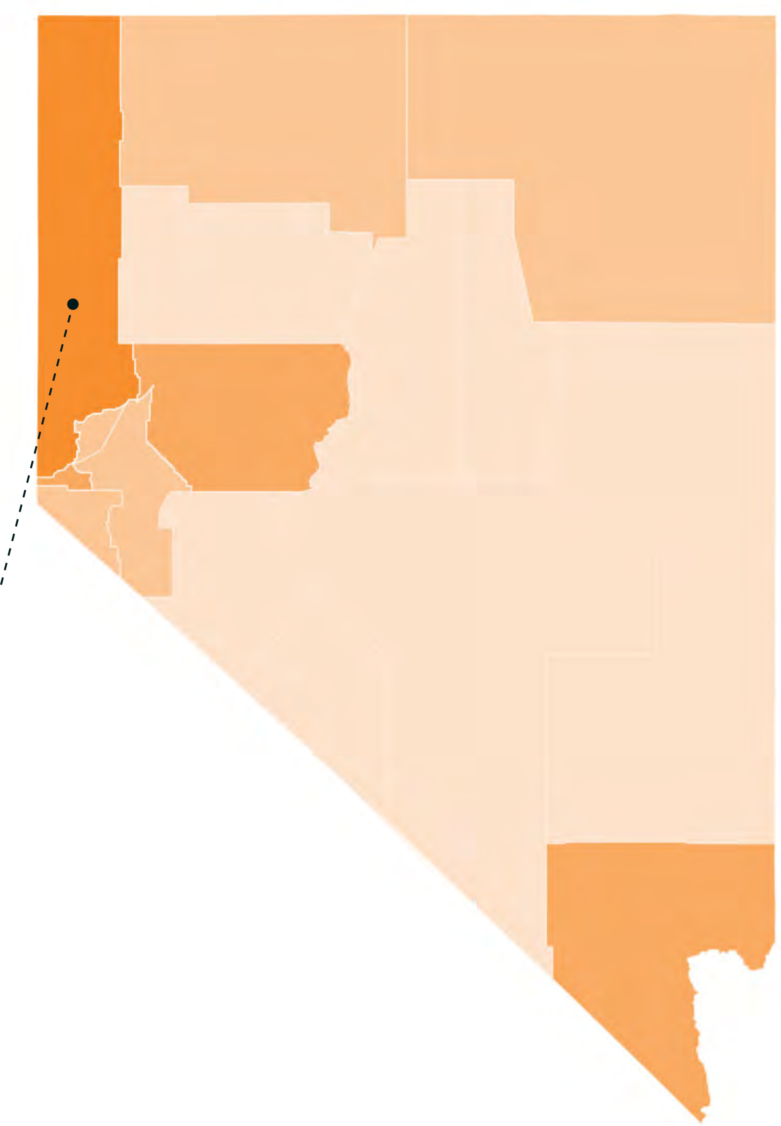
FEDERAL ASSISTANCE 2011–2021

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

$34M
post-disaster assistance

$34M	FEMA obligations
$0	HUD CDBG-DR Funds
$34M	FEMA + HUD assistance
$11	per capita cost

Washoe County has received the most post-disaster federal recovery funds in the state: over $10 million.



FEMA Public Assistance and Hazard Mitigation

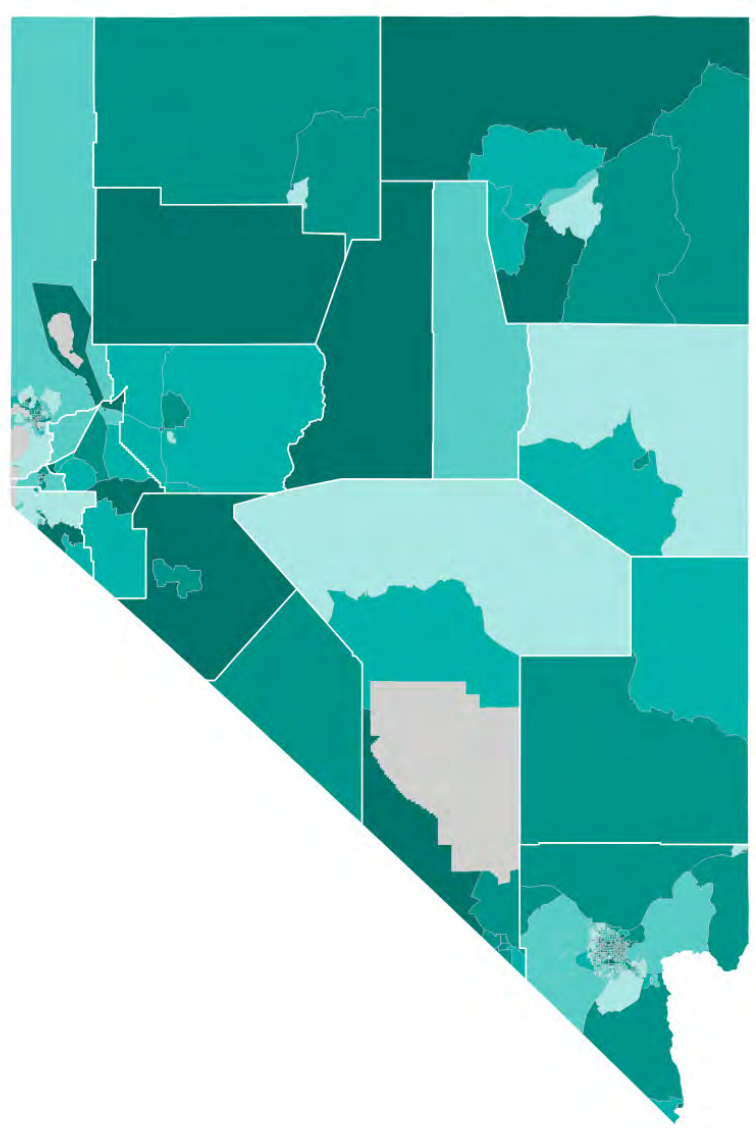
Federal Share Obligated (2011–2021)

- $0 to $100K
- $100K to $1M
- $1M to $10M
- $10M to $50M
- $50M to $100M
- $100M to $1B
- $1B to $9B

Source: FEMA 2021
Maps courtesy of iParametrics

SOCIAL VULNERABILITY INDEX 2011–2021

AREAS OF GREATEST SOCIAL VULNERABILITY



Social Vulnerability Index

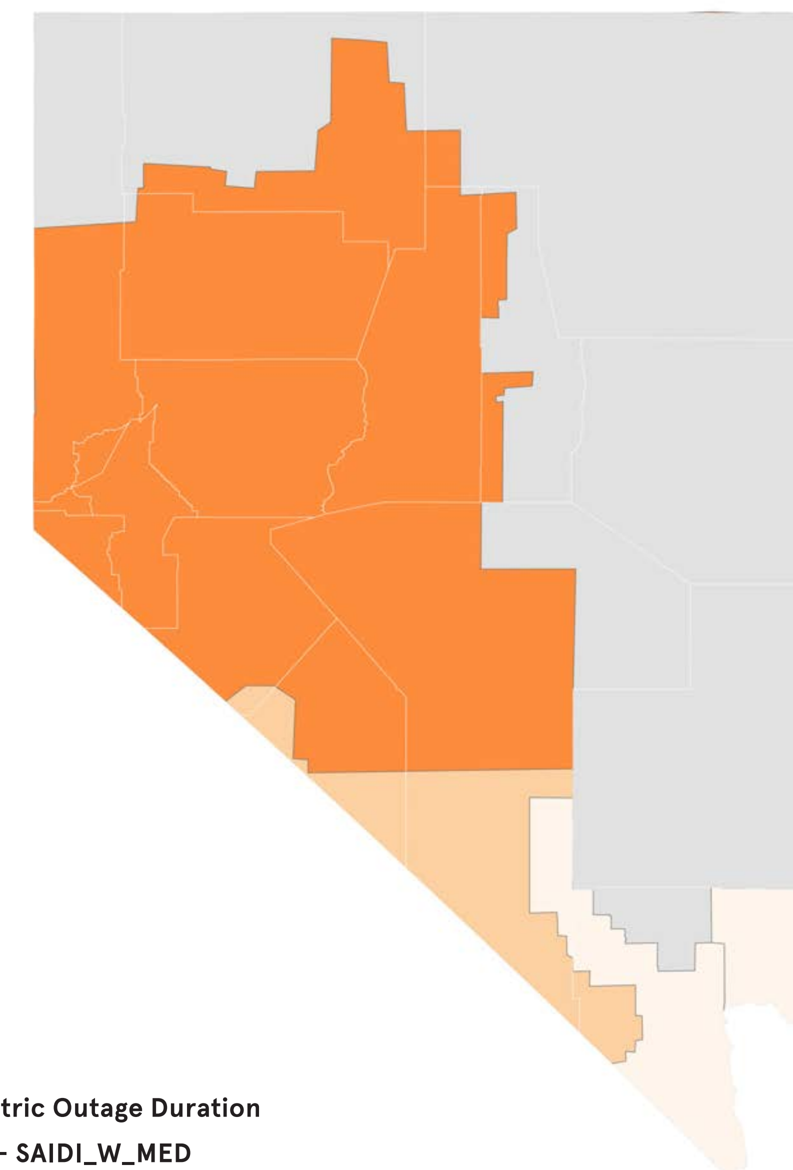
CDC (2018)

- 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



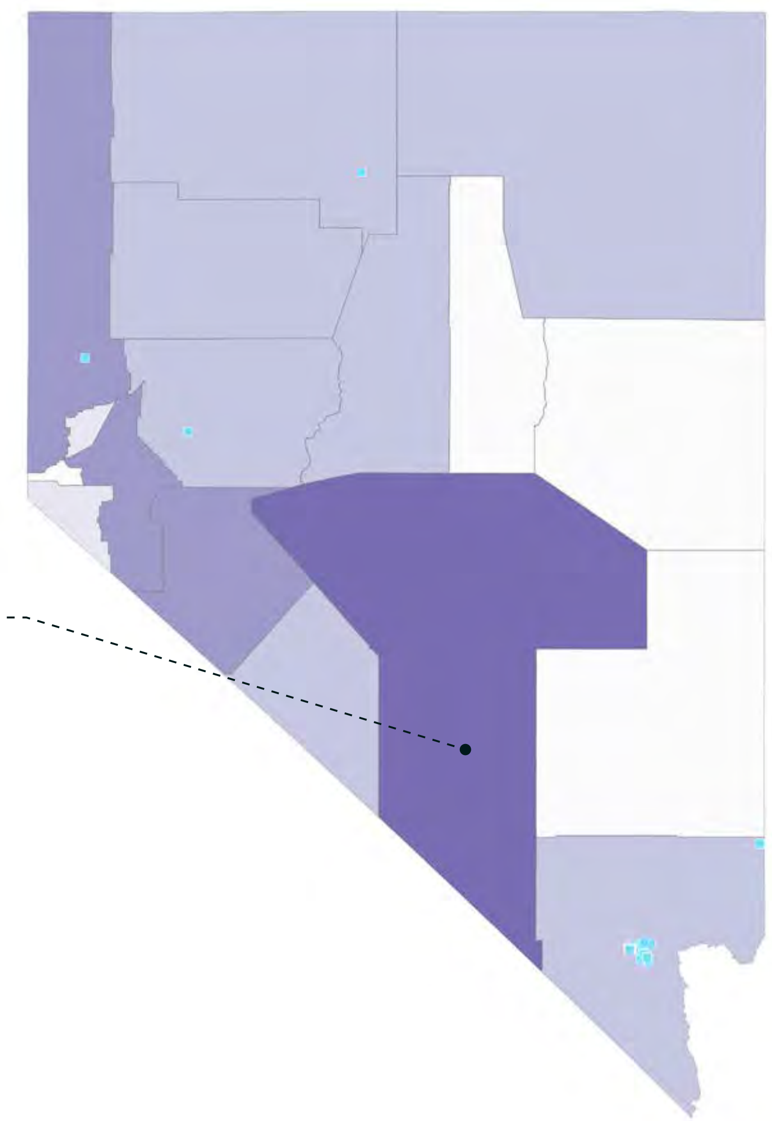
Aggregated Annual Electric Outage Duration

Including major events - SAIDI_W_MED

- 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

COMPOUNDING RISKS: A FRAMEWORK FOR FUTURE INVESTMENT



Nye County has high risk of climate disasters, high increase in population, high health risk, and high poverty rates.

Areas with the greatest return on investment due to physical and social risk

High Compounding Risks

Low Compounding Risks

Superfund Sites

Wastewater Discharge Sites

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))t | 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
Carson City							0
Churchill					1		2
Clark					5		2
Douglas					2		1
Elko					1		2
Esmeralda					1		2
Eureka							0
Humboldt					1		2
Lander					1		2
Lincoln							0
Lyon					1		3
Mineral					1		3
Nye					2		4
Pershing					1		2
Storey					1		1
Washoe					3		3
White Pine							0

NEVADA

TOTAL: 3 DISASTERS FEMA PA + HM: $34 M HUD CDBG-DR: none FEMA + HUD ASSISTANCE: $34 M			2014		2017			
			4202: SEVERE STORMS AND FLOODING		4303: SEVERE WINTER STORMS, FLOODING, AND MUDSLIDES		4307: SEVERE WINTER STORMS, FLOODING, AND MUDSLIDES	
County Name	# of Climate Disasters 2011-2021	Total FEMA Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations
Statewide	3	$9,286,220	$165,556.25	$16,875.57	$4,941,595.66	$106,438.00	$3,924,244.78	$131,510.00
Churchill County	1	$4,759,096					$4,759,095.60	$0.00
Clark County	0	$2,939,837	$2,383,437.23	$556,400.25				
Douglas County	2	$615,090			$438,473.34	$0.00	$176,616.48	$0.00
Elko County	1	$541,182					$541,182.32	$0.00
Esmeralda County	0	$0						
Eureka County	0	$0						
Humboldt County	1	$871,067					$871,067.12	$0.00
Lander County	0	$0						
Lincoln County	0	$0						
Lyon County	1	$278,396			$278,395.83	$0.00		
Mineral County	0	$0						
Nye County	0	$0						
Pershing County	0	$0						
Storey County	2	$736,649			$663,160.22	$0.00	$0.00	$73,489.00
Washoe County	2	$10,680,111			$5,116,721.10	$1,443,473.25	$3,084,935.79	$1,034,981.25
White Pine County	0	$0						
Carson City	2	$2,932,207			$759,793.18	$638,111.30	$729,496.07	$804,806.25
Total FEMA Allocation		$33,639,856	$2,548,993.48	$573,275.82	$12,198,139.33	$2,188,022.55	$14,086,638.16	$2,044,786.50

IMAGE: VALLEY OF FIRE NEVADA | SVEN RUEDIGER

DISASTER OCCURRENCES 2011–2021

	TOTAL DISASTERS
California	25
Mississippi	22
Oklahoma	22
Iowa	21
Tennessee	20
Louisiana	18
Alabama	17
Texas	17
Vermont	17
West Virginia	17
Arkansas	16
Kentucky	16
New Hampshire	16
New York	16
Washington	16
Alaska	15
North Carolina	15
Nebraska	14
Missouri	13
Kansas	13
New Jersey	13
North Dakota	13
South Dakota	13
Montana	12
Oregon	12

	TOTAL DISASTERS
Virginia	11
Florida	11
Georgia	11
Minnesota	11
Connecticut	10
Hawaii	10
Maryland	10
New Mexico	10
Wisconsin	10
Idaho	9
Massachusetts	9
Pennsylvania	9
South Carolina	8
Colorado	7
Utah	7
Maine	6
Michigan	6
Ohio	6
Arizona	6
Delaware	5
Illinois	5
Indiana	4
Rhode Island	4
Wyoming	4
Nevada	3

FEMA AND HUD COST PER CAPITA 2011–2021

	PER CAPITA
Louisiana	$1,736
New York	$1,348
New Jersey	$815
North Dakota	$738
Vermont	$593
Texas	$518
West Virginia	$481
Alaska	$401
Florida	$390
Nebraska	$390
South Carolina	$289
Alabama	$275
South Dakota	$269
North Carolina	$243
Hawaii	$229
Iowa	$228
Oklahoma	$215
Oregon	$210
Missouri	$162
Mississippi	$159
California	$157
Connecticut	$149
Colorado	$141
Kentucky	$105
Tennessee	$97

	PER CAPITA
New Mexico	$97
Arkansas	$81
Massachusetts	$73
Georgia	$64
Montana	$63
Kansas	$60
New Hampshire	$55
Rhode Island	$53
Minnesota	$49
Pennsylvania	$49
Virginia	$49
Maryland	$39
Washington	$36
Wyoming	$32
Idaho	$32
Wisconsin	$27
Illinois	$24
Michigan	$23
Ohio	$19
Maine	$18
Delaware	$14
Utah	$11
Nevada	$11
Indiana	$7
Arizona	$2

MAPPING THE IMPACT

DATA VISUALIZATION TOOLS

It is evident the U.S. is already paying a steep price for this challenge. Rebuild by Design partnered with APTIM and iParametrics to create the following visual tools to demonstrate how climate events have affected each state. The set of six maps depicts which areas have been hit the hardest by recent climate events, where recovery funds are focused, where those individuals with high social vulnerabilities live, and which areas have the least energy reliability.

The U.S. needs to change the way it is making funding decisions. Where we make priority investments is equally important to what we invest in. Returns on investments (ROI) in the form of social benefits to communities needs to be part of grant evaluations. The U.S. need to utilize new decision-making frameworks that are forward-looking. The final map in the set includes an example of a new decision-making framework that takes into account current vulnerabilities and future climate risks. This is one example of how physical and social vulnerability indicators could inform where investments in adaptation infrastructure can yield high returns in social benefits to the most impacted communities. Our team recognizes, however, that there are other decision-making frameworks to explore, and further research is needed to understand which indicators should be included in any state-specific model. Given the ever-present constraints on funding availability, the intent of presenting these maps together is to prompt investments that address multiple known vulnerabilities simultaneously within projects, furthering comprehensive climate adaptation planning.

The following data are designed as a tool to help communities understand their risks to make better-informed choices with higher returns on investment, though each state should determine their own framework for investment.

There are always many ways to present these data. For the purposes of this report, we chose to analyze the years 2011-2021. The following six maps and two tables are presented in this format with the following considerations and limitations:

GEOGRAPHIC MAP

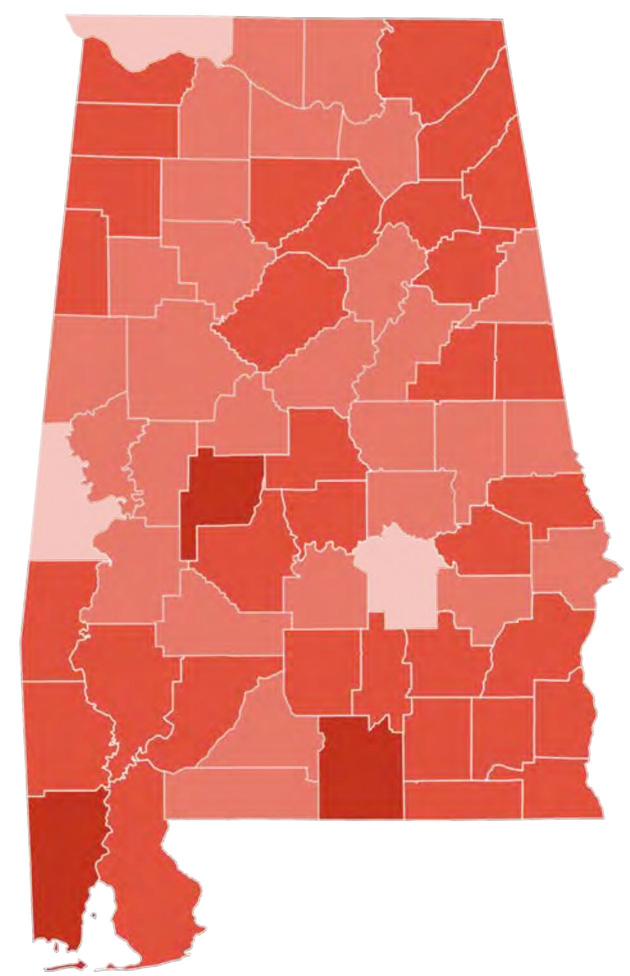
The map provides topographic and geographic context for each state and its surrounding areas, indicating whether the state encompasses coastal, riverine, lake, alpine, or desert land.

GEOGRAPHIC MAP. SOURCE: ESRI WORLD IMAGERY BASEMAP

DISASTER DECLARATIONS (RED)

This map shows federally declared climate disasters by county from 2011-2021 – providing a snapshot of the magnitude of climate disasters across the country in recent history. This report only identifies federally declared disasters, as there is no entity that collects and publishes state disaster declarations. It should be noted that the declarations shown in this report do not reflect every climate event that has occurred between 2011-2021; the report instead only shows those which have met the cost threshold for a federal disaster declaration. Therefore, the findings overall underestimate the number of occurrences and the suffering that some communities have experienced.

According to the Stafford Act, as amended in May 2021, a "major disaster" includes "any natural catastrophe (including any hurricane, tornado, storm, high water, winddriven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."[1]



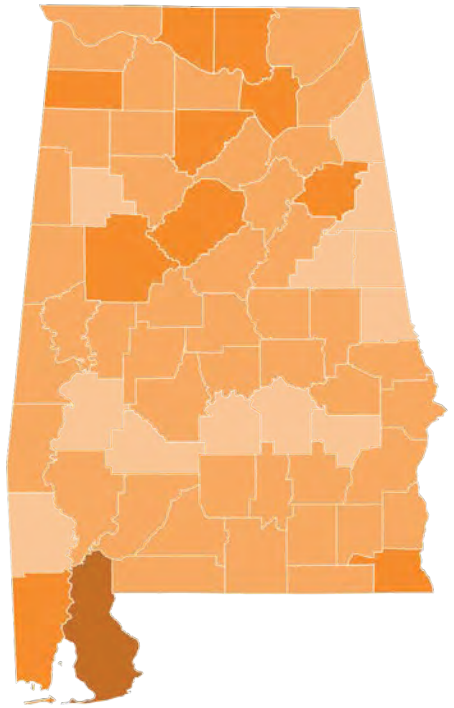
DISASTER DECLARATIONS. SOURCE: FEMA 2021 | MAPS COURTESY OF IPARAMETRICS.

Importantly, extreme heat waves do not fit the criteria for federal disaster declarations despite being the leading cause of deaths among climate hazards. Likewise, sea level rise is not included in this definition despite the threat it poses to numerous communities, including damage to property, loss of land, and displacement.

It should be noted that while most disaster declarations are due to climate events, there are a few instances of disasters due to other natural hazards, such as earthquakes and volcanic eruptions. Though these events are not increasing in magnitude or frequency due to climate change, the severity of their impact may be connected. As climate impacts degrade household and critical infrastructure, communities may become more vulnerable to other natural hazards. Retrofitting infrastructure after these events often requires the same measures as floods, tornadoes, fires, etc., so these events were included in the report to demonstrate the need to prioritize multi hazard adaptation approaches.

FEDERAL ASSISTANCE (ORANGE)

The map shows the amount of federal dollars allocated to counties through FEMA's Public Assistance and Hazard Mitigation Grant Programs between 2011-2021 which allocates funding to individual counties and statewide. The map does not show where "statewide" allocations were spent within the state, but rather only shows county allocations. However, these statewide allocation amounts are included in the Disaster Declaration table at the end of each chapter and included in the "FEMA Total" provided next to the map. The adjacent table adds HUD's Community Development Block Grant Disaster Recovery funds – which are only available to states after a disaster – to the FEMA Total for an estimate of federal post-disaster spending in each state.



FEDERAL ASSITANCE. SOURCE: FEMA 2021 | MAPS COURTESY OF IPARAMETRICS.

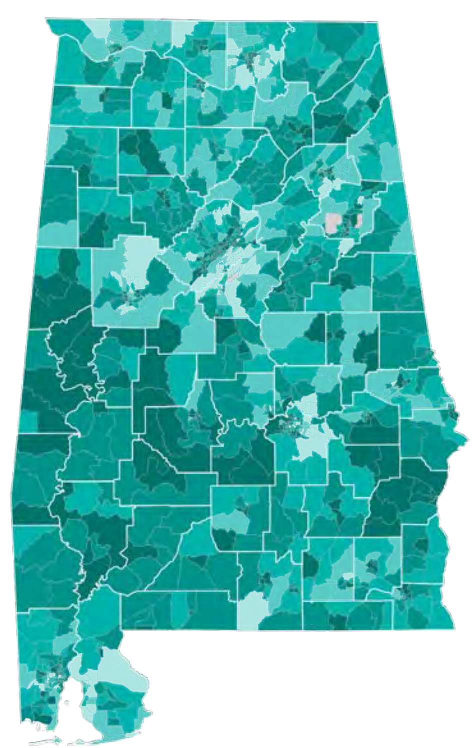
The Disaster Declaration tables provided at the end of each chapter show all federal Disaster Declarations declared between 2011-2021 and the corresponding FEMA obligations associated with those events. **However, in some instances, FEMA continues to obligate funds for years following a declaration. Some states have received funds for events that took place between 2011-2021 after 2021, so the total sum of funds associated with that event are not captured**. All FEMA funds allocated to counties between 2011-2021 are shown in the federal assistance map; however, they do not show up in the Disaster Declaration table if their corresponding event took place prior to 2011. For example, counties in the State of Illinois are still receiving funds from a 1960s storm. The funds obligated to those counties are included in the map, but that event is not included in the Disaster Declaration table at the end of the chapter.

There are additional sources of federal funding made available to governments or individuals in response to disasters, such as the U.S. Army Corp of Engineers (USACE) projects, Small Business Administration (SBA) loans, and private insurance payouts, which are not included in this report because they are harder to uniformly track and/or must be paid back. Therefore, our findings underestimate the total support available to states and individuals post-disaster.

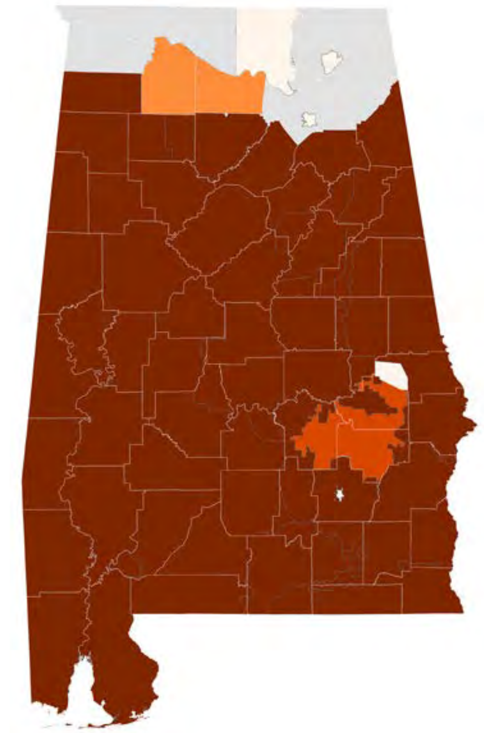
Since disaster aid is allocated to repair physical damage to property, events such as extreme heat, which largely creates physical damage to persons and not property, rarely qualify for federal disaster recovery aid. Additionally, there is only a shallow understanding of the economic impact of social and health-related costs and environmental degradation after a disaster.

SOCIAL VULNERABILITY INDEX (GREEN)

Social vulnerability refers to the potential negative effects on communities caused by external stresses on human well-being. Such stresses include natural or human-caused disasters or disease outbreaks. The factors that determine social vulnerability are directly tied to social determinants of health or the social, economic, and physical factors – such as race, socioeconomic status, and environmental conditions – that influence health. Socially vulnerable populations fare the worst during a disaster and often take longer to recover.[2] The Center for Disease Control/Agency for Toxic Substance and Disease Registry Social Vulnerability Index (CDC/ATSDR SVI) uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters. The map presents the SVI on a census block level, indicating where the most socially vulnerable populations within each county live. The 15 indicators are grouped into four themes: Socioeconomic Status



SOURCE: CDC/ATSDR 2018 SOCIAL VULNERABILITY INDEX
MAPS COURTESY OF IPARAMETRICS



SOURCE: US ENERGY INFORMATION ADMINISTRATION | MAPS COURTESY OF APTIM

(below poverty, unemployed, income, no high school diploma); Household Composition & Disability (aged 65 or older, aged 17 or younger, older than age 5 with a disability, single-parent households); Minority Status & Language (minority, speak English "less than well"); and Housing Type & Transportation (multi-unit structures, mobile homes, crowding, no vehicle, group quarters).

Social Vulnerability Index data are not being used to make post-disaster assistance funding decisions. HUD only requires Low and Moderate Income for a portion of their funding. FEMA does not consider it in their allocations. To learn more about how vulnerable populations fare during climate events, turn to p. 10.

ENERGY RELIABILITY (BROWN)

Climate events often lead to energy disruptions for hours, days, or weeks. This map shows the annual average interruption time (in minutes) across the different energy utility providers within a state. Regions (or utility territories) in the darkest shade, on average, experience longer energy outages. These data are aggregated by utility territory, not county, meaning more than one provider can serve a county or group of counties.

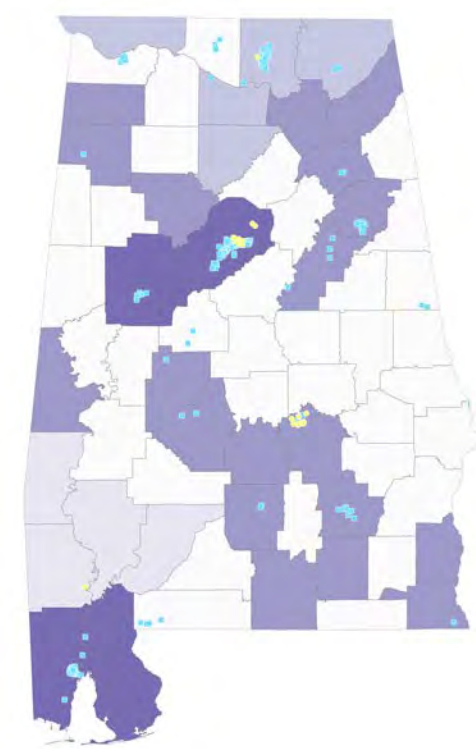
Viewing the Energy Reliability Map next to the SVI Map, one can begin to infer which regions have the most socially vulnerable residents and are served by the least reliable energy providers. Energy reliability is increasingly becoming related to climate disasters and weather events. Inclusion of these maps is to support evaluation of need for concurrent flood and energy resilience projects. To read more about how energy reliability is calculated, see Appendix A.

COMPOUNDING RISKS (PURPLE)

This map overlays multiple physical and social vulnerability indicators to identify areas where new climate infrastructure would have the greatest return on investment.

This map overlays social inputs – population density, increase in population, and health risks – with physical risk inputs – high risk of climate hazards and sea level rise – to get a more detailed picture of the populations who are most vulnerable to climate events to inform future choices of where new climate infrastructure may have the greatest return on investment through the creation of social benefits.

While other composite maps such as FEMA's National Hazard Risk Index demonstrate climate impact and



SOURCES: NOAA, FEMA, 2020 US CENSUS, GHDX, US EPA | MAP COURTESY OF APTIM some demographic information, these maps have added additional criteria, such as population density, population increase, poverty rates, and health risks, to focus on the compounding effects. For instance, if a climate event happens in an area where there is already high social vulnerability, that community is likely to suffer more.

This approach provides an example of how to begin creating new frameworks for allocating funding, moving away from funding based on damage estimates from the previous storm. These assumptions should be ground-checked by each state as data do not always give us the full picture. For instance, in some cases, the areas highlighted for "highest compounding risks" may already have numerous funding sources while others, such as rural communities, may not. In other areas, the location where investments need to be directed may be adjacent to the county with the highest need. For example, an adaptation intervention to protect a downstream riverine community may need to be built upstream in a less vulnerable area to stop flooding at its source.

Analyzed Risks Include:

+ **Climate:** sea level rise, multiple climate hazards
+ **Social:** population density, population increase, and poverty
+ **Health:** cardiovascular disease, neoplasms, and other health indicators

COMPOUNDING RISK (TABLE)

Though 10 data sources went into the data for the purple map, the chart shows a simplified view into how the areas of most need were chosen. An array of physical and social challenges were analyzed and then each county was given a score of 0 to 6, with 6 showing areas with the highest potential for returns on investment in the form of social benefits to the county. In order to qualify for a high need of investment, counties needed to have high climate risk. Read more about this approach in Appendix B.

DISASTER OCCURRENCES AND FEMA INVESTMENTS BY COUNTY (TABLE)

The chart provides the raw county-level disaster data used to inform the first two maps. Our team found that sifting through disaster declaration data is often difficult or not available. By making these data public and easily accessible, it is our intent that other organizations, academics, governments, and other decision-makers will continue to make use of and build on this collection.

ENDNOTES

1 Federal Emergency Management Agency, "Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended," 42 U.S.C. 5121 et seq., and Related Authorities, 2021. [online], www.fema.gov/sites/default/files/documents/fema_stafford_act_2021_vol1.pdf

2 Flanagan, B., Gregory, E., Hallisey, E., Heitgerd, J. & Lewis, B. "A Social Vulnerability Index for Disaster Management. Journal of Homeland Security and Emergency Management," 8(1), 2011. https://doi.org/10.2202/1547-7355.1792

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Fall 2022

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