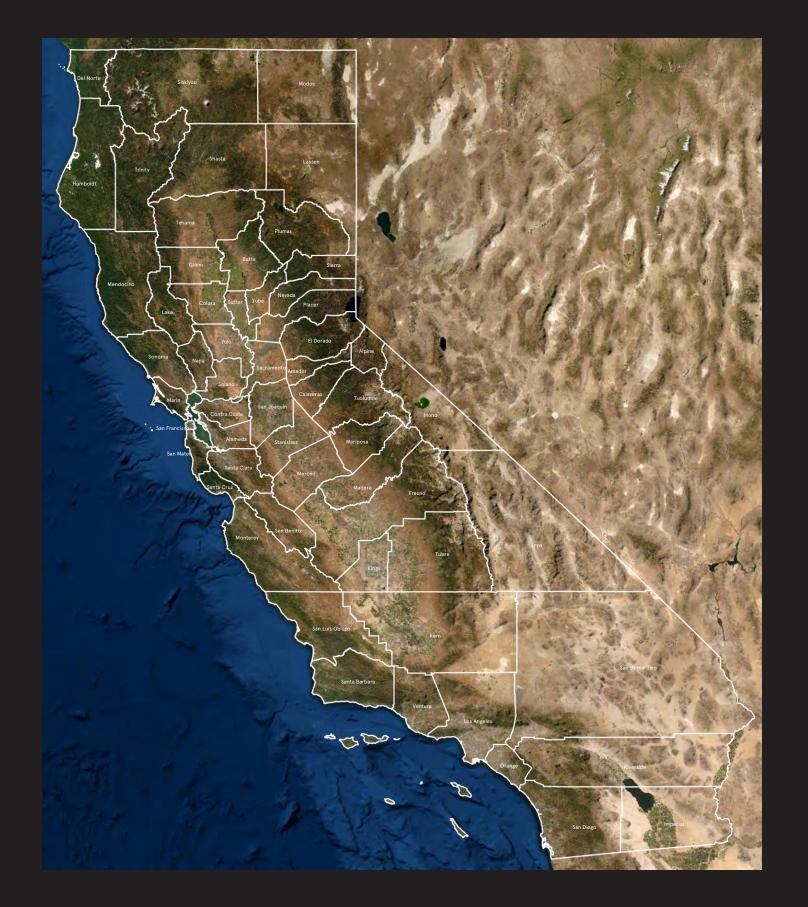
CALTEORNIA



CALIFORNIA STATISTICS SUMMARY (2011 - 2021)

25	CLIMATE DISAST
HIGHEST	NUMBER OF DISA
NAPA	COUNTY WITH T
15	COUNTIES WITH
BUTTE	COUNTY WITH T DISASTERS
1966	SUPERFUND SITE
2557	WASTEWATER DI
C-	ASCE INFRASTRU
ALAMEDA, CONTRA COSTA, DEL NORTE, SACRAMENTO, SAN JOAQUIN, YUBA	HIGHEST COMPO
\$6.2 BILLION	FEMA + HUD POS
39.3 MILLION	POPULATION TO
\$157	PER CAPITA SPEI
\$32.9 BILLION	OF CLIMATE INFI A SMALL INSURA

ER DECLARATIONS

SASTERS IN THE COUNTRY

THE HIGHEST DISASTER OCCURENCES

FIVE OR MORE DISASTERS

HE HIGHEST FEDERAL SPENDING ON CLIMATE

ΈS

SCHARGE SITES

UCTURE REPORT CARD GRADE

OUNDING RISKS

ST-DISASTER FUNDING

OTAL

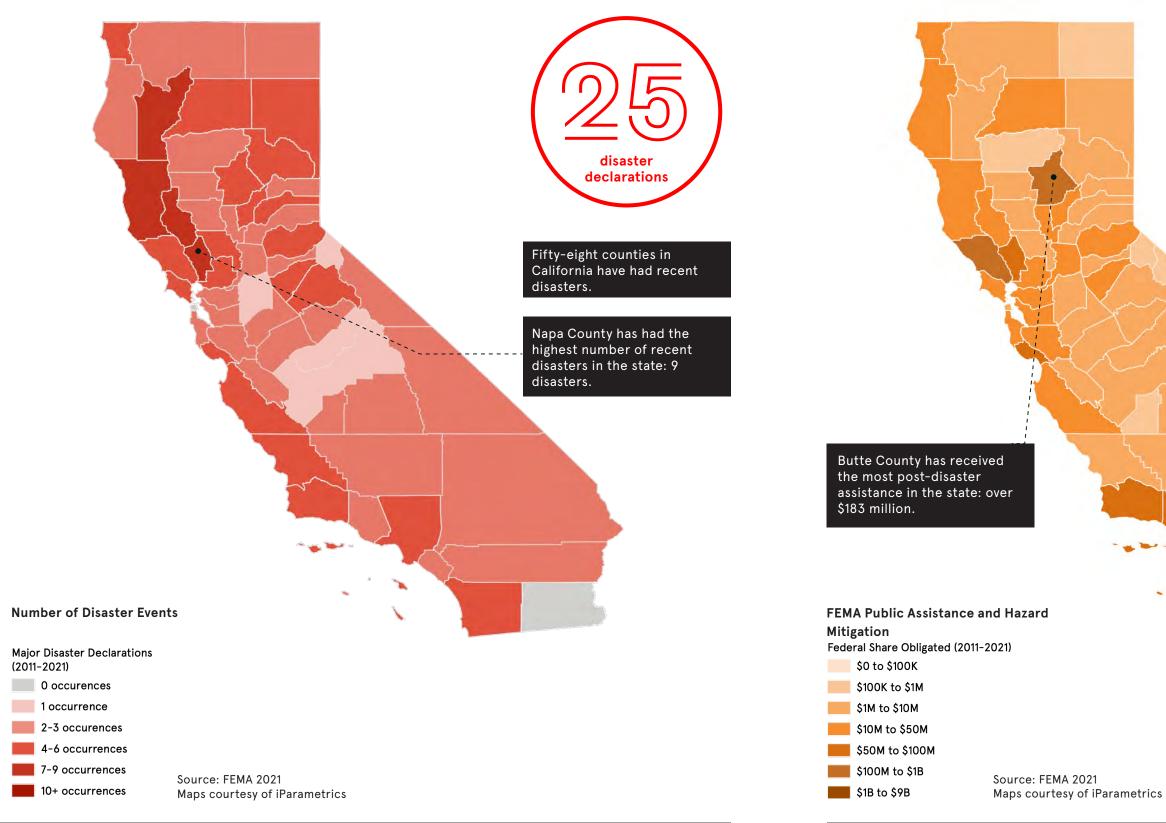
ENDING ON CLIMATE DISASTERS

FRASTRUCTURE COULD BE SUPPORTED THROUGH ANCE SURCHARGE

DISASTER OCCURRENCES 2011-2021

FEDERALLY DECLARED MAJOR DISASTERS BY COUNTY

FEDERAL ASSISTANCE 2011-2021 POST-DISASTER PUBLIC ASSISTANCE AND HAZARD MITIGATION FUNDS **OBLIGATED BY COUNTY FOR CLIMATE DISASTERS**





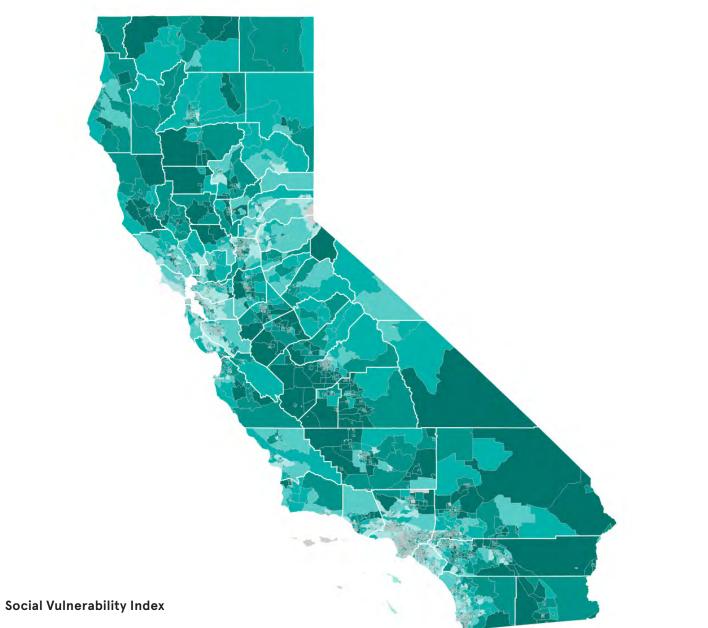
\$4.5B	FEMA obligations
\$1.6B	HUD CDBG-DR Funds
\$6.2B	FEMA + HUD assistance
\$157	per capita cost

In 2018, California received \$2 billion in post-disaster FEMA assistance across three wildfire disasters.

SOCIAL VULNERABILITY INDEX 2011-2021

AREAS OF GREATEST SOCIAL VULNERABILITY

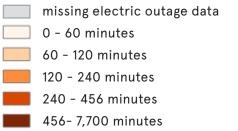
ENERGY RELIABILITY 2011-2021 COUNTIES AT GREATEST RISK OF POWER OUTAGES



CDC (2018)	
No Value	
0.0 - 0.2	
0.2 - 0.4	
0.4 - 0.6	
0.6 - 0.8	Source: CDC/ATSDR 2018 Social Vulnerability Index
0.8 - 1.0	Maps courtesy of iParametrics



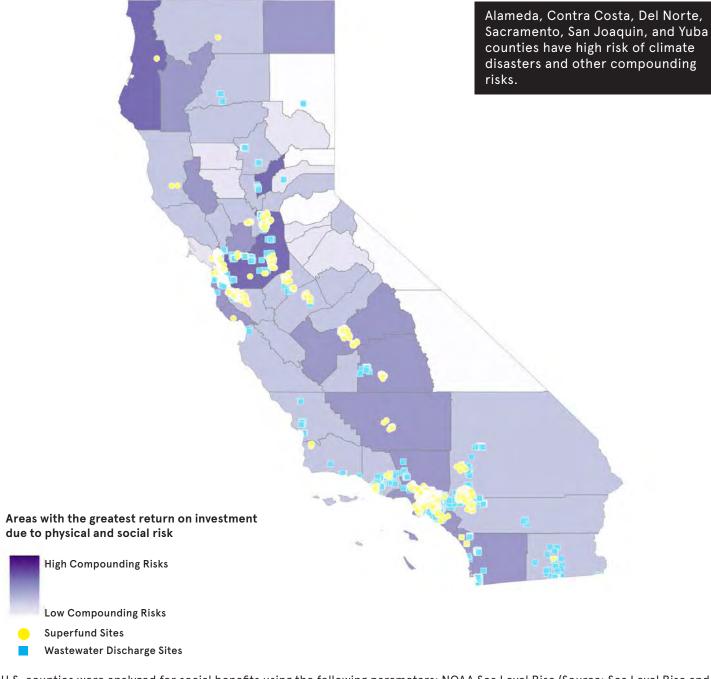
Aggregated Annual Electric Outage Duration Including major events - SAIDI_W_MED



Administration Maps courtesy of APTIM

Source: U.S. Energy Information

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))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
Alameda					2		4
Alpine					1		2
Amador					1		1
Butte					4		2
Calaveras					3		1
Colusa					1		1
Contra Costa					2		4
Del Norte					1		4
El Dorado					•		0
Fresno					5		3
Glenn					1		1
Humboldt					2		4
					3		2
Imperial					3		
Inyo					2		0
Kern					3		3
Kings					2		2
Lake					3		3
Lassen							0
Los Angeles					6		3
Madera					4		2
Marin							1
Mariposa					2		2
Mendocino					5		2
Merced					4		2
Modoc					2		3
Mono							0
Monterey					4		2
Napa					2		2
Nevada					2		1
Orange					2		3
Placer					1		2
Plumas					3		1
Riverside					4		2
Sacramento					3		4
San Benito					1		2
San Bernardino					3		2
San Diego					3		3
San Francisco					1		3
San Joaquin					2		4
					1		2
San Luis Obispo San Mateo					1		
Santa Barbara					3		3
							2
Santa Clara					1		2
Santa Cruz					2		3
Shasta					5		2
Sierra							0
Siskiyou					3		2
Solano					2		3
Sonoma					4		2

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
Stanislaus					2		2
Sutter					1		2
Tehama					1		2
Trinity					2		3
Tulare					4		3
Tuolumne					3		1
Ventura					3		2
Yolo					1		2
Yuba					1		4

"The magnitude of the challenge is self-evident, the extreme droughts, the record-breaking heat that we experienced just 24 or so months ago, record-breaking wildfires ... require us to do more and to manage these existential threats more aggressively. We're doing everything in our power, not just rhetorical."

- Governor Newsom



TOTAL: 25 DISAS FEMA PA + HM: \$			201	1	2013	2014	2	015			20	017					2018				2019			2	020		2021
HUD CDBG-DR: S	51.6 B	=. ¢6 2 B	1952: SEVERE WINTER STORMS, FLOODING, AND DEBRIS AND MUD FLOWS				4206: SEVERE STORMS,	4240: VALLEY FIRE AND BUTTE	4301: SEVERE WINTER STORMS		4305: SEVERE WINTER STORMS,	4308' SEVERE WINTER	STORMS			4353: WILDFIRES, FLOODIN	NG, 4382: WILDFIRES AND	HIGH	4422: SEVER FLOODING, LAN	E STORMS, DSLIDES, AND 4423: SEVERE ST	DRMS AND 4425: SEVERE STORMS A	4431: SEVERE WINTER STORMS	5, 4434: SEVERE WINTER STORMS, FLOODING, LANDSLIDES, AND				
	of Climate isasters Tot		FLOWS	1968: TSUNAMI WAVES	4142: WILDFIRE 4158:	RIM FIRE 4193: EARTHQUAKE	FLOODING, AND MUDSLIDES	FIRE	FLOODING, AND MUDSLIDES		FLOODING, AND MUDSLIDES			4312: FLOODING	4344: WILDFIRES	MUDFLOWS, AND DEBRIS FL	LOWS WINDS	4407: WILDFI			G FLOODING	MUDSLIDES	MUDSLIDES	4558: WILDFIRES	4569: WILDFIRES	4610: WILDFIRES	4619: WILDFIRES
County Name 2	011-2021 Ob	bligations \$3,397,710.97	PA Obligations HM Obligations	PA Obligations HM Obligations PA Ob \$1,284,364 \$1,172,334	bligations HM Obligations PA Obligations	HM Obligations PA Obligations HM Obligations 8273.204 \$5.535.216	ations PA Obligations HM Obligation	PA Obligations HM Obligations	PA Obligations HM Obligations	PA Obligations HM Obligations	s PA Obligations HM Obligations	PA Obligations HM C	Obligations PA	A Obligations HM Obligations							Obligations PA Obligations HM Obligations			PA Obligations HM Obligatio	ns PA Obligations HM Oblig	ations PA Obligations HM Oblig	gations PA Obligations HM Obligations
Alameda County	3	\$17,941,38	89	\$1,20 1 ,00 1	\$2,929,0		910,972 91,000,000		\$2,752,582 \$3,062,355			0 \$6,647,458		\$205,933 ¢	φ410,020,795 φ21,517	,505 \$205,715,550 \$75	J2,202 0314,000,040 0	\$1,171,310 \$1,043,333,032	φ21,111,412 Φ040,031	φυ φ2,007,711	40 4173,570	φυ φυ,υτο,σσο φο ιτι,τ	09 01,009,047 0024,00	φ201,239,300 φ170,	\$14 \$135,002,730		φυ φ σ,σ10,200 φυ
Alpine County Amador County	1	\$458,11 \$3,210,71							\$241,192 \$0 \$1,119.012 \$0			\$216,925 \$1,858,303	\$0 \$0										\$233,397 \$				
Butte County	6	\$183,345,25	51						\$6,302,647 \$0			\$3,268,948	\$0		\$106,139	\$0		\$158,859,407	\$6,034,778				\$1,756,391 \$	\$7,016,942	\$0		
Calaveras County Colusa County	3	\$21,592,44 \$2,306,19						\$13,642,173 \$3,411,750	\$1,634,280 \$0 \$272,363 \$0		\$11,144 \$6,620	6 \$1,170,911 \$1,076,677	\$0 \$0									\$1,318,199 \$397,3 \$87,103	65 \$0 \$870,054 \$				
Contra Costa County	3	\$24,374,86	63	\$18,646,214 \$686,966					\$3,608,183 \$0		\$451,791 \$6		\$3,945,705														
El Dorado County	5	\$21,133,11 \$15,160,71		\$18,646,214 \$686,966					\$6,793,300 \$0	J	\$840,071	\$1,704,751 0 \$6,848,395	\$0 \$0										\$4,874 \$ \$0 \$317,25		\$90,310	\$0	\$361,695 \$0
Fresno County	1	\$2,436,86										\$169.970	¢0												\$2,436,863	\$0	
Humboldt County	3	\$2,260,74 \$22,066,05							\$7,973,332 \$1,974,171			\$168,870 \$7,206,106	\$0										\$2,091,873 \$ \$4,696,357 \$112,50	\$103,589	\$0		
Imperial County	0	\$36,50 \$304,06							\$0 \$0		\$36,505 \$4 \$0 \$4	0															
Kern County	2	\$8,110,38	87 \$4,100,690 \$0						φυ φυ		\$4,009,697 \$6	0															
Kings County	2	\$84,56 \$23,935,71	69 \$84,569 \$0 14					\$12.256.828 \$897.881	\$1 868 024 \$0			\$0 \$3,503,225	\$0 \$99 774		\$314.835 \$86	125	\$2.305.129	so					\$1,865,504 \$158,46	\$579 921	\$0		\$0.
Lassen County	4	\$1,988,63	39						\$459,692 \$0			\$1,290,665												\$238,282	\$0	\$0	\$0
Los Angeles County Madera County	4	\$93,695,63 \$1,463,19							\$962,413 \$0		\$11,220,114 \$712,930	6				\$0 \$2,22	22,817	\$51,523,775	\$20,650,738						\$6,402,844 \$1,112,282	\$0 \$0	
Marin County	4	\$11,314,29	93						\$3,701,206 \$2,982,753			\$2,708,858	\$0									\$1,598,222	\$0 \$323,254 \$				
Mariposa County Mendocino County	7	\$1,259,14 \$24,200,61	42 \$103,994 \$0 12						\$4,474,676 \$0		\$5,440,648 \$286,443	\$1,155,148 3	\$0		\$5,711,765 \$6,008	,591						\$0 \$0	\$0 \$0 \$ \$0 \$2,121,729 \$	\$86,143	\$0 \$70,616	\$0	
Merced County	2	\$1,325,42							\$616,093 \$0			\$709,330	\$0									A 105 500	20				
Modoc County Mono County	3	\$232,75 \$391,74							\$64,968 \$0		\$10,484 \$ \$28,827 \$	0 \$86,708 0 \$297,951	\$0									\$135,566	\$U				
Monterey County	5	\$27,448,21 \$46,941,31	18	\$3,107,906 \$0		\$20,730,200 \$2,	147 429		\$12,144,855 \$0 \$3,955,989 \$474,035		\$970,869	\$11,442,337	\$0		\$7,268,977 \$2,912	000						02	\$347,453 \$ \$0 \$512,055 \$	\$405,667 \$2,314,798	\$0	eo	
Napa County Nevada County	5	\$3,379,84				φ20,730,200 φ2,	-+/,+>0		\$1,744,146 \$0	· · · · · · · · · · · · · · · · · · ·		\$834,491	\$0		\$137,302 \$498	,167						<u>م</u> ن الم	\$0 \$312,000 \$	\$165,737	\$0 \$0	\$0	\$0
Orange County Placer County	3	\$18,287,24 \$4,110,23	44 \$8,912,552 \$0						\$4,078,725 \$0		\$3,417,567 \$30,000 \$31,507 \$6	0			\$2,689,082 \$3,238	,043										\$0	\$0
Plumas County	4	\$2,011,89	90						\$853,091 \$0			\$989,817	\$0											\$108,038	\$0	\$0 \$60,943	\$0
Riverside County Sacramento County	3	\$28,699,81 \$13,347,52							\$4,072,664 \$973,888		\$3,356,628 \$ \$4,084,714 \$	0 \$4,115,780	\$100.482									\$21,103,280	\$0				
San Benito County	2	\$1,216,53	36						\$508,402 \$0			\$708,134	\$0														
San Bernardino County San Diego County	2		59 \$43,112,365 \$217,028 70 \$7,800,776 \$736,983								\$5,244,045 \$6	0				\$0	\$0								\$2,473,466 \$407,366	\$0 \$0	
San Francisco County	0	\$	\$0																								
San Joaquin County San Luis Obispo County	1 4	\$4,423,39 \$7,940,03							\$1,275,992 \$0	J	\$439,596 \$		\$468,917 \$2,240,335														
San Mateo County	3	\$11,326,67	79								\$2,982,312 \$381,474		\$1,125,767			\$52,413,167 \$25	52.004					\$1,367,567 \$411,6	20	\$1,567,794	\$0		
Santa Barbara County Santa Clara County	3	\$65,357,83 \$32,342,73			\$335,38	\$2,720,383			\$13,423,881 \$0		\$644,977 \$1,127,83	\$11,244,170	\$3,922,882 \$3,000,000			۵۵۲,413,167 \$25 ۵۵۲	55,204					\$1,367,567 \$411,6	29	\$1,618,950	\$0		
Santa Cruz County	5	\$65,900,58	83	\$14,665,229 \$601,692					\$3,617,472 \$838,388		\$11,590,950 \$41,43		\$0				\$17,208,844	\$950 700				¢0 655 507	0.0	\$7,247,488	\$0	03	
Shasta County Sierra County	3	\$29,166,08 \$4,236,11							\$4,268,736 \$0 \$1,277,981 \$0			\$2,643,163 \$2,620,630	\$0 \$0				\$17,208,844	φοου,/υυ				\$3,655,537	φU	\$337,499	\$529,107 \$0	¢۵	
Siskiyou County Solano County	3	\$1,336,61 \$10,797,40	14			\$3,344,995 \$	120,882		\$471,575 \$0 \$3,841,915 \$0			\$566,342 \$1,102,689	\$0		\$794,522 \$197	032								\$1,395,366	\$298,697	\$0	
Solano County Sonoma County	6	\$10,797,40 \$97,869,53				۵ ۵,344,995 \$			\$3,841,915 \$0 \$2,889,042 \$2,407,018			\$1,102,689 \$2,889,794	\$0 \$2,849,656		\$794,522 \$197 \$58,372,563 \$18,225								\$7,248,226 \$888,11		\$0 \$748,884	\$0	
Stanislaus County	2	\$2,902,42 \$9,208,30							\$1,415,377 \$2,624,163			\$2,533,063 \$5,168,764	\$0											\$369,361	\$0		
Sutter County Tehama County	3	\$9,208,30 \$748,11							φ1,+10,577 φ2,024,103			\$264,383	\$0										\$483,730 \$			\$0	\$0
Trinity County	7	\$4,448,77 \$1,510,39	76 92 \$1,497,218 \$0						\$35,390 \$0		\$1,215,994	0 \$1,193,086	\$0									\$869,493	\$0 \$180,108 \$	\$946,479 \$13,174	\$0	\$8,227	\$0
Tuolumne County	6	\$9,168,12			\$1,156,98	87 \$892,467			\$4,236,608 \$0		\$741,467 \$	0 \$1,270,759	\$0										\$579,104	\$290,735	\$0		

CALIFORNIA

DISASTER OCCURRENCES 2011-2021

FEMA AND HUD COST PER CAPITA 2011-2021

	TOTAL DISASTERS		TOTAL DISAST
California	25	Virginia	11
Mississippi	22	Florida	11
Oklahoma	22	Georgia	11
lowa	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	ldaho	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	Illinois	5
South Dakota	13	Indiana	4
Kentucky	12	Rhode Island	4
Montana	12	Wyoming	4
Oregon	12	Nevada	3

	PER CAPITA		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	\$481	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	ldaho	\$32
lowa	\$228	Wisconsin	\$27
Oklahoma	\$215	Illinois	\$24
Oregon	\$210	Michigan	\$23
Missouri	\$162	Ohio	\$19
Mississippi	\$159	Maine	\$18
California	\$157	Delaware	\$14
Connecticut	\$149	Utah	\$11
Colorado	\$141	Nevada	\$11
Kentucky	\$105	Indiana	\$7
Tennessee	\$97	Arizona	\$2

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. Together, these maps depict 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 we are 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. needs to utilize new decision-making frameworks that are forward-looking. The final map in the set of maps 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 is designed as a tool to help communities understand their risks to make betterinformed choices with higher returns on investment though each state should determine their own framework for investment.

There are always many ways to present this 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.

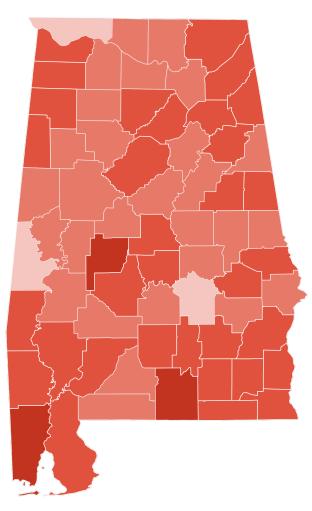


GEOGRAPHIC MAP. SOURCE: ESRI WORLD IMAGERY BASEMAP

DISASTER DECLARATIONS (RED):

Federally declared climate disasters by county 2011-**2021.** The map provides 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



DISASTER DECLARATIONS SOURCE: FEMA 2021 | MAPS COURTESY OF IPARAMETRICS

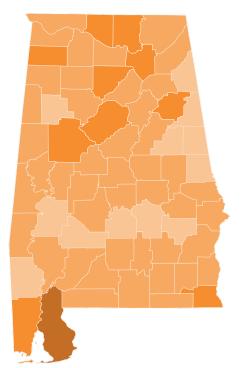
explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity 2 and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."1

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.

FEDERAL ASSISTANCES (ORANGE):

Public Assistance and Hazard Mitigation funding obligated by county for climate disasters 2011-2021 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 allocations are in the Disaster Declaration table and included in the "FEMA Total." 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.

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



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

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.

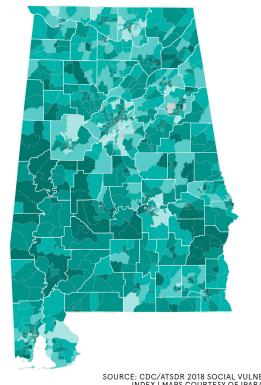
Since disaster aid is allocated to repair physical damage to property, events such as extreme heat, which creates physical damage to persons and not property, rarely qualify for federal disaster recovery aid. Additionally, there is only a shallow understanding of the economic impact of social and health-related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

SOCIAL VULNERABILITY **INDEX (GREEN):**

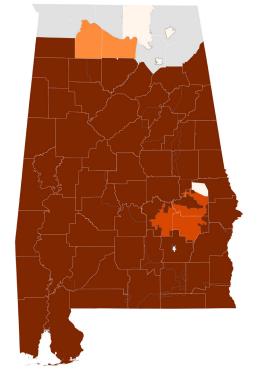
Social vulnerability refers to the potential negative effects on communities caused by external stresses on human well-being. Such stresses include natural or human-caused disasters or disease outbreaks.

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 (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 is 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 page XX







This approach provides an example of how to begin to create new frameworks for allocating funding, SOURCE: US ENERGY INFORMATION ADMINISTRATION | MAPS COURTESY OF APTIM moving away from funding based on damage estimates from the previous storm. These assumptions should be ground-checked by each state as data does not always give us the full picture. For instance, in some cases, the areas highlighted for "greatest need" may already have numerous funding sources while others, such as rural communities, may not. In other areas,

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. This data is aggregated by utility territory, not county, meaning more than one provider can serve a county or group of counties.

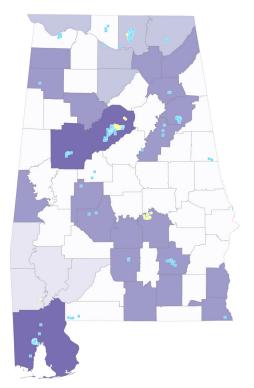
Viewing the Energy Reliability Map next to the SVI Map, one can begin to infer which regions have the most socially vulnerable residents and are served by the least reliable energy providers. Energy reliability is increasingly becoming related to climate disasters and weather events. Inclusion of these 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.

While other composite maps such as FEMA's National Hazard Risk Index demonstrate climate impact and some demographic information, these maps have added additional criteria, such as population density, population increase, high poverty rates, and health risks. We did this 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.



SOURCES: NOAA, FEMA, 2020 US CENSUS, GHDX | MAP COURTESY OF APTIM

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

Storm water discharge indicator and Superfund proximity: U.S. Environmental Protection Agency EJSCREEN Indexes–2020 Public Release.

RANKING OF NEEDS:

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 combined and then ranked on a scale 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

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 this 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.

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REBUILD

DESIGN

IPK

Fall, 2022

BY

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MAPPING THE IMPACT

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