



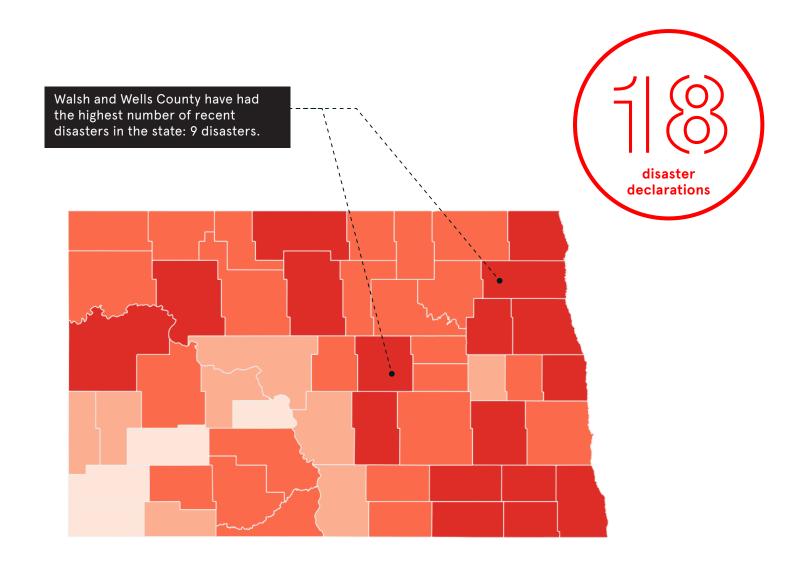
NORTH DAKOTA STATISTICS SUMMARY (2011 - 2024)									
18	CLIMATE DISASTER DECLARATIONS								
\$659.7 MILLION	FEMA + HUD POST-DISASTER FUNDING								
779.6K PEOPLE	POPULATION TOTAL								
\$846	PER CAPITA SPENDING ON CLIMATE DISASTERS								
WALSH & WELLS (9 DISASTERS)	COUNTY WITH THE HIGHEST DISASTER OCCURRENCES								
35	COUNTIES HAVE HAD FIVE OR MORE DISASTERS								
16K PEOPLE	LIVE IN AREAS WITH VERY HIGH SOCIAL VULNERABILITY (SVI > 0.75)								
4.4 HOURS	TOTAL OUTAGE DURATION (HOURS PER CUSTOMER PER YEAR)								
C (2019)	ASCE INFRASTRUCTURE REPORT CARD GRADE								
2	SUPERFUND SITES								
\$1.2 BILLION	CLIMATE INFRASTRUCTURE SUPPORTED THROUGH SMALL INSURANCE SURCHARGE								

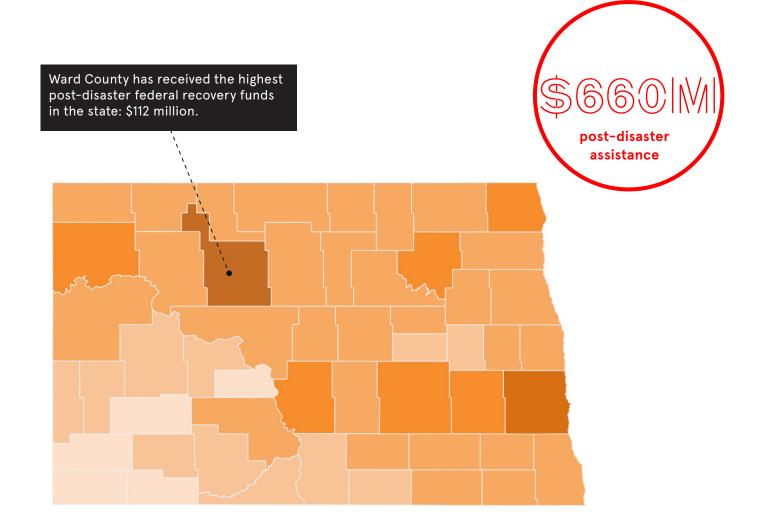
DISASTER OCCURRENCES 2011–2024

FEDERALLY DECLARED CLIMATE DISASTERS
BY COUNTY 2011 - 2021

FEDERAL ASSISTANCE 2011-2024

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





Number of Disaster Events

Major Disaster Declarations (2011-2024)

0 occurences

1 occurrence

2-3 occurences
4-6 occurrences

7-9 occurrences

10+ occurrences

66% of counties in North Dakota have had 5 or more recent diasters.

MAP MADE BY REBUILD BY DESIGN FEMA DATA COURTESY OF IPARAMETRICS

FEMA Public Assistance and Hazard Mitigation

Federal Share Obligated (2011-2024)

\$0 to \$100K

\$100K to \$1M

\$1M to \$10M

\$10M to \$50M

\$50M to \$100M \$100M to \$500M **\$464M** FEMA obligations

\$195M HUD CDBG-DR Funds

\$660M FEMA + HUD assistance

\$846 per capita cost

MAP MADE BY REBUILD BY DESIGN FEMA DATA COURTESY OF IPARAMETRICS

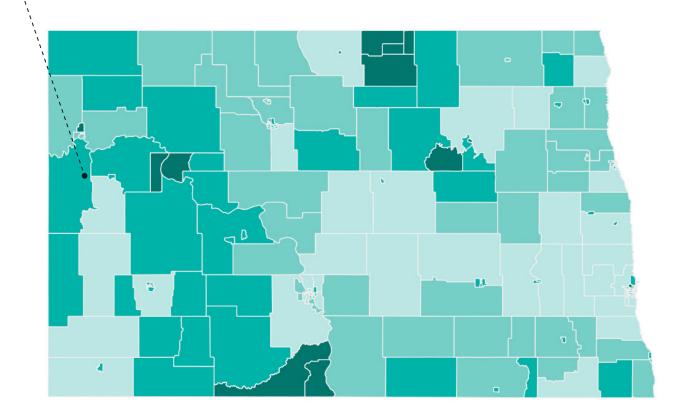
211

210

SOCIAL VULNERABILITY INDEX 2022

AREAS OF GREATEST SOCIAL VULNERABILITY

McKenzie County grew the most in North Dakota from 2010 to 2024, 121%, and experienced 8 recent diasters with a social vulnerability of 0.47.



Social Vulnerability Index

CDC (2022)



0.0 - 0.2



0.4 - 0.6

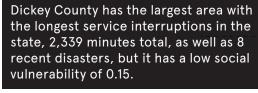
0.6 - 0.8

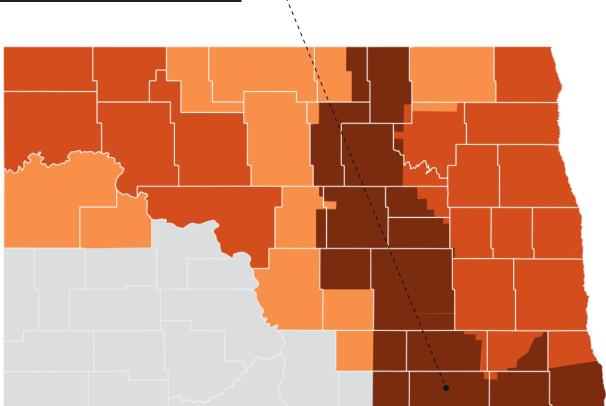
0.8 - 1.0

MAP MADE BY REBUILD BY DESIGN DATA SOURCE: CDC/ATSDR 2022 SVI

ENERGY RELIABILITY 2023

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

MAP MADE BY REBUILD BY DESIGN SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION 2023

213

12

TOTAL : 19 DISASTEDS			Total	201	1		2013			2014	2017	2019	9			2020		202	21	20	022		20	023			2024
TOTAL: 18 DISASTERS																		4642, CEVE	DE CTODM			4686: SEVE	RE WINTER			47CO. CEVEDE MINIT	-n
FEMA PA + HM: \$464.4 M				1981: FLOODING	1986: SEVERE WINTER	4118: FLOODING	/ERE STORMS 4128: SEVERE S			4190: SEVERE STORMS	4323: FLOODING	4444: FLO	ODING	4475: FLO	OODING	4553: FLOODI	ING 4565: SEVERE STORM	S 4613: SEVEI STRAIGHT-LI			ERE WINTER	STORM, SN		4717: FLO	DDING	4760: SEVERE WINTI STORM AND STRAIGH	4852: WILDFIRES AND
HUD CDBG-DR: \$195.3 M FEMA + HUD ASSISTANCE: \$659.7 M				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	STORM	AND I	FLOODING FLOOD	NG STO	ORM	AND FLOODING	10201120020	20	20				AND FLOODING	AND FLO		STORM AND	D FLOODING	AND STRA				LINE WINDS	STRAIGHT-LINE WINDS
IGEOID ICOUNTY NAME	# OF DISASTERS	FEMA TOTAL P	A Obligations HM Obligations	PA Obligations HM Obligations	s PA HM Obligations Obligations	PA HM PA s Obligations Obligation	HM PA Obligations	HM PA Obligations Obligations	HM Obligations	PA HM Obligations Obligations Ol	PA HM Obligations Obligations	PA Obligations	HM Obligations	PA Obligations	HM Obligations PA Obl	igations Ob	HM PA HM oligations Obligations Obligation	PA ons Obligations	HM Obligations	PA Obligations	HM Obligation	PA os Obligations	HM Obligations	PA Obligations	HM Obligations	PA HM Obligations Obligat	PA HM ions Obligations Obligations
38000 38000: Statewide	17	\$71,900,975.64	\$66,303,386.68 \$5,597,588.96	\$35,534,404.72 \$3,350,566.00	0 \$594,139.59 \$16,871.00	0 \$615,427.91 \$249,154.00 \$239,920.	\$0.00 \$639,382.20	\$46,212.00 \$4,219,741.98	3 \$44,473.00	\$189,046.14 \$15,803.00 \$	\$409,306.96 \$195,703.72	\$773,334.98	\$1,165,383.88	\$649,601.00	\$264,431.44 \$76	6,101.47 \$1	157,580.50 \$181,494.39 \$38,891	.67 \$187,567.01	\$52,518.75	5 \$12,228,669.21	1 \$0.	.00 \$1,738,346.61	1 \$0.00	\$428,139.75	\$0.00	\$6,908,762.15	0.00
38001 38001: Adams County	3	\$81,327.03	\$81,327.03 \$0.00					\$50,483.73	\$0.00			\$30,843.30	\$0.00							\$0.00	\$0.	.00					
38003 38003: Barnes County	7	\$13,618,622.86	\$11,890,273.29 \$1,728,349.57	\$6,991,264.74 \$993,584.25	25							\$192,823.02	\$0.00	\$868,271.42	\$0.00 \$89	4,709.12 \$1	137,388.82			\$2,510,325.34	4 \$0.	.00		\$251,611.00	\$597,376.50	\$181,268.65	0.00
38005 38005: Benson County	6	\$4,982,290.56	\$3,101,894.56 \$1,880,396.00	\$1,983,740.62 \$1,880,396.00	00	\$157,135.06 \$0.00	\$215,420.93	\$0.00		\$348,605.57 \$0.00 \$	\$218,492.19 \$0.00						\$178,500.19 \$0	.00									
38007 38007: Billings County	2	\$182,037.47	\$182,037.47 \$0.00	\$182,037.47 \$0.00	00															\$0.00	\$0.	.00					
38009 38009: Bottineau County	7	\$3,376,413.25	\$3,376,413.25 \$0.00	\$2,114,091.02 \$0.00	\$0.00 \$0.00	0 \$87,106.91 \$0.00	\$19,953.47	\$0.00		\$202,874.90 \$0.00 \$	\$952,386.95 \$0.00									\$0.00	\$0.	.00					
38011 38011: Bowman County	1	\$0.00	\$0.00 \$0.00					\$0.00	\$0.00																		
38013 38013: Burke County	5	\$9,520,430.82	\$9,520,430.82 \$0.00	4.00,002.10	00 \$421,298.51 \$0.00	0												\$51,382.93	\$0.00	0 \$8,564,172.20	7.1.			\$30,195.00	\$0.00		
38015 38015: Burleigh County	3	\$25,486,970.53	\$24,916,500.93 \$570,469.60	\$23,778,056.52 \$0.00	00		\$24,223.59	\$0.00												\$1,114,220.82	2 \$570,469.	.60					
38017 38017: Cass County	5	\$51,225,761.81	\$15,729,916.06 \$35,495,845.75	\$9,813,160.54 \$35,493,509.75		\$3,117,774.94 \$2,336.00						\$1,828,055.95	\$0.00		\$76	3,207.27	\$0.00									\$207,717.36	0.00
38019 38019: Cavalier County	5	\$4,387,461.08	\$4,387,461.08 \$0.00	\$519,950.32 \$0.00	00	\$538,977.84 \$0.00	\$310,354.41	\$0.00		\$1,	,373,115.24 \$0.00		• • • •	•						\$1,645,063.27	· ·						
38021 38021: Dickey County	8	\$3,147,357.70	\$3,097,857.70 \$49,500.00	\$2,248,972.42 \$49,500.00	00 00 00					000 557 40		\$439,066.01	\$0.00	\$148,066.75	\$0.00 \$11	1,062.28	\$0.00	• •		\$108,601.26	6 \$0.	φυ.σο	\$0.00	\$20,994.60	\$0.00	\$21,094.38	0.00
38023 38023: Divide County	5	\$2,168,938.03	\$2,144,761.56 \$24,176.47	\$2,085,826.69 \$0.00			000 000 000	MO 00		\$38,557.19 \$0.00								\$0.00	\$0.00					6440.440.00	00.00		
38025 38025: Dunn County	4	\$172,789.35	\$172,789.35 \$0.00 \$1,539.737.60 \$25.597.00	¢4.252.000.44	\$0.00 \$0.00		\$32,376.72	\$0.00		\$104.646.02				¢00.704.47	#0.00					\$0.00	\$0.	.00		\$140,412.63	\$0.00		
38027 38027: Eddy County	2	\$1,564,324.69 \$294.794.50	\$1,528,737.69 \$35,587.00	\$1,352,992.44 \$0.00		\$28,895.34 \$35,587.00	\$15,469.41	\$0.00		\$104,616.03 \$0.00		¢114.250.50	#0.00	\$26,764.47				£406,004,00	CO. OC	0							
38029 38029: Emmons County 38031 38031: Foster County	5	\$381,781.59 \$889,564.54	\$381,781.59 \$0.00 \$868.564.54 \$21.000.00	\$504.702.75 \$21.000.00	10	\$91,159.27 \$0.00						\$114,350.50	\$0.00	\$70,740.00 \$112,404.04	\$0.00 \$0.00 \$3	8.902.52	\$0.00	\$196,691.09	\$0.00	\$121,395.96	5 \$0.	00					
38033: Poster County 38033: Golden Valley County	ວ າ	\$168,472.70	\$168.472.70 \$0.00	\$504,702.75 \$21,000.00	10	\$91,159.27 \$0.00								\$112,404.04	\$0.00 \$5	0,902.52	\$0.00			\$121,395.96				\$168,472.70	\$0.00		
38035 38035: Grand Forks County	7	\$9,630,468.13	\$8.859.632.38 \$770.835.75	\$667.665.19 \$390.769.00	10							\$603,153.59	00.02	\$1 <i>1</i> 15 002 08	\$151 3/0 75 \$1 57	7 118 16 \$2	228.717.00 \$1.268.100.96 \$0	.00		\$2,713,689.91	70.			\$613,672.19	\$0.00		
38037 38037: Grant County	6	\$644,934.57	\$644.934.57 \$0.00	\$121.498.75 \$0.00				\$107,128.58	\$0.00			\$11,387.70	\$0.00	+ 1, 112, 22=122	ψ151,549.75 ψ1,57	7,440.40 ψ2	220,717.00 \$1,200,100.90 \$0	\$404,919.54	\$0.00) \$0.			ψ013,072.19	ψ0.00	\$0.00	0.00
38039 38039: Griggs County	3	\$969,625.43	\$943.191.43 \$26.434.00	, ,				ψ107,120.00	φυ.συ			ψ11,007.70	ψ0.00	\$129,531.04	\$0.00			ψτοτ,515.0τ	ψ0.00	\$161,911.07	7 \$0.					φυ.υυ φ	0.00
38041 38041: Hettinger County	4	\$304,133.14	\$34.863.75 \$269.269.39	\$20,101.00 \$\text{\$\pi_20,101.00}\$				\$0.00	\$228,663.00			\$11,286.00	\$18.547.57	ψ120,001.01	φσ.σσ					\$0.00				\$23,577.75	\$0.00		
38043 38043: Kidder County	7		\$3,870,573.64 \$29,606.00	\$1,216,155.44 \$29,606.00	0		\$112,519.54		4223,000.00			4.1,233.33	4.0,011.0 1	\$1,436,386.71	\$0.00 \$94	7,153.03	\$0.00	\$22,275.60	\$0.00			.00 \$8,317.79	9 \$0.00		40.00		
38045 38045: LaMoure County	8		\$3,490,642.60 \$816,729.89				, , , , , ,					\$824,864.72	\$16,654.73			•	\$38,974.16	\$72,708.25		· · ·	2 \$131,250.		, , , , ,	\$90,347.67	\$0.00	\$20,863.20	0.00
38047 38047: Logan County	6		\$2,392,055.64 \$0.00		00							\$113,309.39	\$0.00	\$213,499.61	\$0.00 \$32	8,751.11	\$0.00			\$64,167.10						\$0.00	0.00
38049 38049: McHenry County	7	\$6,857,849.56	\$6,857,849.56 \$0.00	\$4,928,983.22 \$0.00	00	\$267,901.21 \$0.00	\$902,786.39	\$0.00		\$158,391.62 \$0.00 \$	\$404,176.65 \$0.00									\$0.00	\$0.	.00		\$195,610.47	\$0.00		
38051 38051: McIntosh County	4	\$835,552.71	\$835,552.71 \$0.00	\$701,432.40 \$0.00	0										\$8:	2,390.23	\$0.00			\$51,730.08	\$0.	.00				\$0.00	0.00
38053 38053: McKenzie County	8	\$4,748,272.56	\$4,711,840.56 \$36,432.00	\$55,433.67 \$36,432.00	00 \$773,748.39 \$0.00	0	\$336,727.99	\$0.00				\$391,514.91	\$0.00				\$195,662.95 \$0	.00 \$52,226.59	\$0.00	0 \$2,906,526.06	\$ 0.	.00					\$0.00 \$0.0
38055 38055: McLean County	3	\$3,120,679.15	\$2,402,108.05 \$718,571.10	\$1,181,111.59 \$42,419.00	00		\$200,914.30	\$21,543.00												\$1,020,082.16	\$654,609.	.10					
38057 38057: Mercer County	3	\$343,593.70	\$343,593.70 \$0.00	\$260,229.50 \$0.00	00																	\$37,133.36	6 \$0.00	\$46,230.84	\$0.00		
38059 38059: Morton County	5	\$9,742,111.63	\$9,708,361.63 \$33,750.00	\$7,514,554.41 \$33,750.00	00		\$1,867,610.48	\$0.00 \$11,821.28	\$0.00			\$176,632.60	\$0.00											\$137,742.86	\$0.00		
38061 38061: Mountrail County	8	\$2,300,582.14	\$2,248,492.18 \$52,089.96	\$1,406,594.22 \$46,048.00	\$0.00 \$0.00	0	\$394,678.11	\$0.00		\$73,346.36 \$0.00				\$124,952.64	\$0.00			.00		\$0.00	\$6,041.	.96		\$248,920.85	\$0.00		
38063 38063: Nelson County	8	\$2,894,778.65	\$2,790,890.55 \$103,888.10	\$881,205.26 \$18,092.00	00		\$399,836.02	\$0.00						\$211,812.27	\$0.00 \$23	5,783.49	\$0.00 \$138,456.28 \$85,796	.10		\$857,449.71	1 \$0.	.00 \$8,967.76	6 \$0.00	\$57,379.76	\$0.00		
38065 38065: Oliver County	1	\$0.00	\$0.00 \$0.00																	\$0.00							
38067 38067: Pembina County	8	\$10,009,375.47	\$8,639,008.57 \$1,370,366.90	\$1,006,055.21 \$1,264,977.00	00	\$158,391.26 \$77,975.00	\$682,020.52	\$0.00			\$254,877.01 \$0.00		\$0.00		\$46	6,328.38 \$	\$27,414.90			\$5,028,947.80	\$0.	.00		\$824,661.07	\$0.00		
38069 38069: Pierce County	4	+=,000,01=100	\$2,863,912.38 \$0.00	***************************************			\$639,683.06	\$0.00		\$464,111.31 \$0.00 \$	\$124,504.37 \$0.00																
38071 38071: Ramsey County	4	* 11,010,000110	\$10,804,092.18 \$712,717.00	\$8,863,832.98 \$685,799.00		\$40,204.71 \$0.00	\$469,592.33	\$26,918.00				0.45=	• • • •			·	00.00			\$1,430,462.16				0-1		044 222 =	0.00
38073 38073: Ransom County	7		\$2,444,342.22 \$0.00	, , , , , , , , , , , , , , , , , , , ,		0 004 070 74 040 400 50				075 400 70 040 074 00	400 507 00	\$107,269.72	\$0.00		\$19	5,503.46	\$0.00			\$639,065.63			0 \$0.00	\$74,069.05	\$0.00	\$11,366.73	0.00
38075 38075: Renville County	б 7		\$1,054,417.13 \$29,542.00 \$5,004.203.23 \$29,542.00	70,	\$0.00 \$0.00	\$ \qua				\$75,160.79 \$16,054.00	\$99,587.88 \$0.00		00.00		, , ,	2 200 70	¢0.00			\$0.00				ΦE40.070.04	00.00	Φ0.00	0.00
38077 38077: Richland County	7	40,000,0222	\$5,094,263.22 \$264,761.00 \$4,542.000.65 \$264,761.00	\$1,801,339.43 \$264,761.00		\$370,244.60 \$0.00	\$400.04F.00	#0.00		Ф.	Φ054 C05 40 Φ00 440 00	\$465,614.12	\$0.00		\$4	3,268.72	\$0.00			\$1,896,923.51				\$516,872.84	\$0.00	\$0.00	0.00
38079 38079: Rolette County	0	\$1,617,169.59 \$1,424,917.63	\$1,542,993.65 \$74,175.94 \$1,288,258.63 \$136.659.00	\$918,536.10 \$0.00 \$696,365.32 \$32,709.00		\$39,937.93 \$0.00	\$139,845.98	\$0.00		\$	\$254,695.13 \$20,118.00		#0.00	\$215 803 23	\$0.00 \$9	2 270 07 - 04	103 050 00			\$189,978.51 \$88,546.51			0 00 00	\$65,888,24	\$0.00	\$0.00	0.00
38081 38081: Sargent County 38083 38083: Sheridan County	5	\$1,424,917.63 \$1,048,603.46	\$1,288,258.63 \$136,659.00 \$989.835.88 \$58,767.58	\$680,836.90 \$0.00			\$145,639.06	\$0.00				\$128,275.36 \$51,817.67	\$0.00 \$58,767.58			3,379.97 \$1 9,435.10	\$0.00			Φ00,040.51	1 \$0.	.00 \$0.00	\$0.00	φ00,888.24	\$0.00	φυ.υυ \$	0.00
38085 38085: Sioux County	1	\$1,048,603.46 \$347,514.89	\$347,514.89 \$0.00	\$257,444.05 \$0.00			\$140,009.00	\$0.00	\$0.00	\$45,132.49 \$0.00		ψ51,017.07	ψ50,707.56	φυΖ, 107.15	φυ.υυ \$7	3,433.10	ψ0.00	\$44,938.35	\$0.00	0							
38085 38085: Sloux County 38087 38087: Slope County	1	\$0.00	\$0.00					\$0.00		φ 1 0, 102.49 φ0.00								ψ44, 930.33	φυ.υι								
38089 38089: Stark County	1	\$25,572.81	\$25,572.81 \$0.00				\$25,572.81		Ψ0.00																		
38091 38091: Steele County	6		\$5.757.363.51 \$603.900.00	\$722.086.83 \$0.00	00		Ψ20,012.01	φυ.υυ				\$411,982.19	\$0.00		\$56	6,416.26 \$6	603,900.00			\$3,937,719.76	\$0.	.00		\$119,158.47	\$0.00	\$0.00	0.00
38093 38093: Stutsman County	5		\$13.907.479.57 \$176.429.00	, ,								Ţ.11,00 <u>2</u> .10	ψ0.00	\$5,635,148.92			\$0.00			\$648,546.30		.00		\$110,100.47	ψ0.00		0.00
38095 38095: Towner County	6		\$3,319,526.51 \$69,509.00	\$1,635,859.76 \$53,550.00		\$130,217.43 \$0.00	\$236,573.90	\$15,959.00		\$	\$498,467.32 \$0.00			, , , , , , , , , , , , , , , , , , , ,	ψ1,30	,				\$702,013.13		.00		\$116,394.97	\$0.00	Ψ	
38097 38097: Traill County	7		\$7,322,027.06 \$200,722.00			\$110,164.79 \$21,591.00	+230,010.00			The state of the s	ψο.σο	\$182,453.73	\$0.00	\$289,833.89	\$0.00 \$96	0,394.96	\$0.00			\$5,344,457.12				, , , , , , , , , , , , , , , , , , , ,	40.00	\$0.00	0.00
38099 38099: Walsh County	9		\$8,711,310.83 \$330,766.54			\$937,674.50 \$267,351.00	\$304,838.79	\$0.00		\$	\$717,254.36 \$36,364.50		\$27,051.04	+ ===,====		.,	\$0.00			\$2,228,758.66				\$823,878.98	\$0.00		
38101 38101: Ward County	5	#######################################	\$86,594,162.54 \$25,809.440.56	\$83,430,820.28 \$25,751,601.00			\$1,697,339.32	\$0.00		\$653,063.61 \$0.00	723,0000	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , , ,		, , , , , , , , , , , , , , , , , , ,					\$812,939.33				, , , , , , , ,	,		
38103 38103: Wells County	9	\$4,126,563.97	\$3,551,315.03 \$575,248.94	\$2,003,229.22 \$231,123.00		\$374,363.97 \$0.00	\$313,580.83							\$579,867.06	\$114,291.00 \$7	6,490.73	\$0.00 \$28,214.56 \$133,572	38		\$32,970.45			4 \$96,262.56	\$122,378.17	\$0.00		
38105 38105: Williams County	6	\$23,509,998.87			00 \$4,145,736.64 \$0.00													.00 \$1,690,500.43	\$0.00								\$0.00 \$0.0
Total Total	18	##########################	885,754,584.73 \$78,673,525.00			0 \$7,097,551.41 \$667,482.00 \$239,920.	\$0.00 \$10,126,940.16	\$110,632.00 \$4,389,175.57	7 \$273,136.00	\$2,352,906.01 \$31,857.00 \$5.	5,306,864.06 \$252,186.22	\$8,208,143.59	\$1,286,404.80	\$12,794,829.21	\$662,372.19 \$11,11	5,956.40 \$1.2						.45 \$1,812,985.56	\$96,262.56	\$5,116,609.86	\$597,376.50	\$7,351,072.47	0.00 \$0.00 \$0.0

APPENDIX

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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 decisionmaking 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 2011–2024. 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.

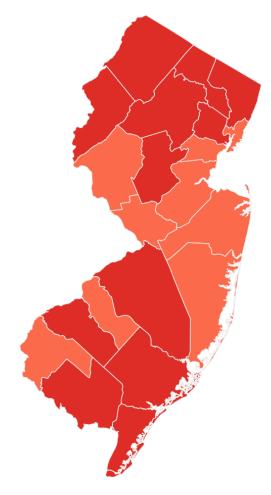


GEOGRAPHIC MAP. SOURCE: ESRI WORLD IMAGERY BASEMAP

DISASTER DECLARATIONS (RED)

This map shows federally declared climate disasters by county from 2011-2024 – 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 2011-2024; 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,



DISASTER OCCURRENCES SOURCE: FEMA 2011-2024 MAP MADE BY REBUILD BY DESIGN

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."

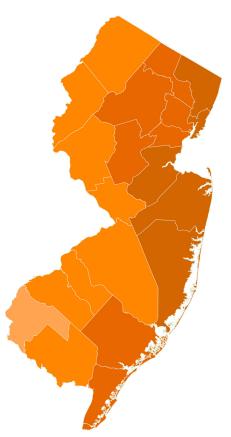
Importantly, extreme heat waves do not fit the criteria for federal disaster declarations despite being the leading cause of deaths among climate hazards. Likewise, sea level rise is not included in this definition despite the threat it poses to numerous communities, including damage to property, loss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

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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 2011-2024 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 ASSISTANCE SOURCE: FEMA (HA+PM) 2011-2024 MAP MADE BY REBUILD BY DESIGN

The Disaster Declaration tables provided at the end of each chapter show all federal Disaster Declarations declared between 2011-2024 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 2011-2024 after 2024, so the total sum of funds associated with that event are not captured. All FEMA funds allocated to counties between 2011-2024 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. 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



SOCIAL VULNERABILITY SOURCE: CDC/ATSDR 2022 MAP MADE BY REBUILD BY DESIGN

level, indicating where the most socially vulnerable populations within each county live. The 15 indicators are grouped into four themes:

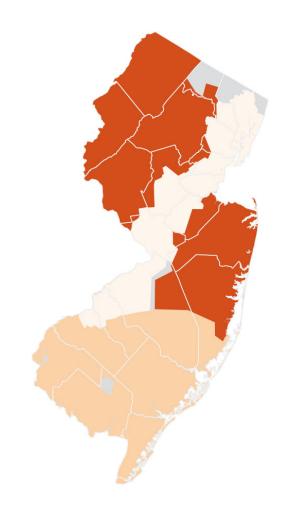
- Socioeconomic Status (below poverty, unemployed, income, no high school diploma);
- Household Composition & Disability (aged 65 or older, aged 17 or younger, older than age 5 with a disability, single-parent households);
- Minority Status & Language (minority, speak English "less than well"); and
-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

Social Vulnerability Index data 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.

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.



ENERGY RELIABILITY SOURCE: US ENERGY INFORMATION ADMINISTRATION 2023 MAP MADE BY REBUILD BY DESIGN

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System Average Interruption Duration Index (SAIDI)

is one of the performance metrics used to measure the reliability of an electric utility's service. This metric measures the total time (in minutes) an average customer experiences a non-momentary power interruption over a one-year (calendar) period.

A Major Event Day (MED) is another metric which occurs when the SAIDI exceeds a specific threshold within a given day and tends to reflect outages on the longer end of the spectrum. The data presented in this report shows a metric of SAIDI combined with MED to highlight and report electric reliability in areas (utility territories) irrespective of the root cause of the interruption. The Energy Reliability Map displays the SAIDI_W_MED metric for utility territories and highlights areas that are susceptible to electric system vulnerabilities based on reliability performances. These vulnerabilities serve as an indicator as to where investments and improvements in the distribution grid should be focused.

Electric utilities experience power interruptions due to a variety of issues. Those issues include inclement weather, vegetation management practices, utility practices, maintenance patterns, and capital investment strategy, among others, which all play a part in a utility's overall reliability performance. The U.S. Energy Information Administration produces an Annual Electric Power Industry Report which utilizes data collected from U.S. electric utilities reflecting their reliability performance against certain industry standards and performance metrics. Utilities have the flexibility to report interruptions according to duration and frequency either with major events, without major events, or both.

The annual SAIDI is the summation of the individual SAIDIs for each non-momentary interruption event over the entire year (2023):

 $SAIDI = \frac{\sum (Duration of Interruption \times No. of Sustained Customer Interruptions)}{Total No. of Customers Served}$

For utilities that report SAIDI metrics using the Institute of Electrical and Electronics Engineers (IEEE) standards, "non-momentary" interruptions are those lasting

longer than five minutes. A Major Event Day (MED) is another metric which occurs when the SAIDI exceeds a specific threshold within a given day and tends to reflect outages on the longer end of the spectrum.

Utilities have certain flexibilities when reporting with these metrics. Including MED in the SAIDI metric (SAIDI_W_MED) provides an overall picture of the electric reliability experienced by customers. Excluding MED from the SAIDI metrics (SAIDI_WO_MED) tends to separate power interruption events by their durations, which provides an indicator of the source of the power interruption (i.e., distinguishes a Major Event vs. Systematic Operation interruption).

Our methodology utilizes SAIDI_W_MED as the primary measurement indicator for the electric reliability experience of the end user (customer). Our SAIDI_W_MED metric highlights the reported electric reliability in areas (utility territories, counties, and states) irrespective of the root cause of the interruption. Our metric does not exclude interruptions categorized as MEDs.

This report endeavors to highlight areas across the national electric distribution network (utility territories) that are susceptible to electric system vulnerabilities based on historical reliability of performance. We view vulnerabilities caused by major events (longer duration outages) on par with vulnerabilities caused by systematic failures (shorter duration outages) and believe they should equally drive electric grid investment and improvement decisions. These investments should also incorporate solutions aimed at mitigating systemic vulnerabilities that stem from issues like vegetation management practices, distribution automation improvements to major event vulnerabilities with root causes embedded in grid hardening, distribution generation schemes, and Automated Metering Infrastructure (AMI) upgrades aimed at minimizing customer interruption numbers and durations.

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