EMERGENCY MANAGEMENT RESEARCH INITIATIVE (EMRI) UPDATE

UNIVERSITY OF CENTRAL FLORIDA

UCF COASTAL — NATIONAL CENTER FOR INTEGRATED COASTAL RESEARCH

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Our Mission: Integrate the most appropriate science and most comprehensive available data to improve emergency preparedness, planning, response, resilience and recovery at local, state, national, and international scales.

HAZARD AWARE AND THE NEW FIRST LINE OF DEFENSE

HazardAware

Know Your Risk. Be Risk Ready.

HazardAware is one output from ongoing research by a team of more than 25 co-PIs and a host of post-docs, graduate researchers, and undergraduates from nine universities/research organizations entitled "The New First Line of Defense: Building Community Resilience through Residential Risk Disclosure".

This work aims to democratize scarce and largely inaccessible hazard, risk, impact, and associated recovery data in a meaningful way for individuals and communities.

A home's HazardReady^{BETA} Score

The HazardReady^{BETA} Score combines environmental, community, and building characteristics in a user friendly and accessible format.

HazardReady^{BETA} Score: **28** Less Resilient

0 — Less Resilient … More Resilient — 100

HazardAware provides an individual HazardReady^{BETA} Score for 15.4 million Gulf Coast homes along with options for making it safe.

Users can learn about any address, access community information, and learn how to mitigate hazards/protect their home.

HazardAware helps residents and community planners make their homes and communities more resilient to natural hazards.

Project Partners

UCF Coastal — University of Central Florida

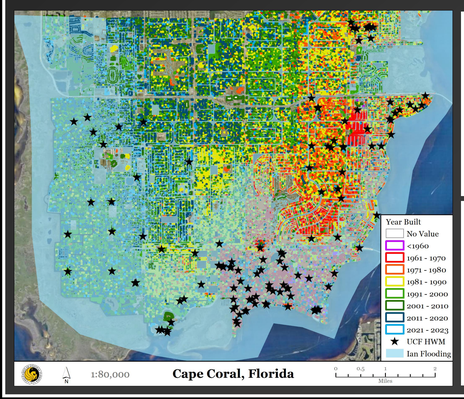
HVRI Hazards & Vulnerability Research Institute

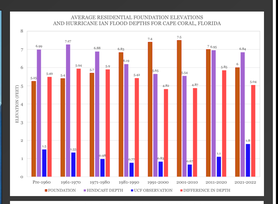
HazardAware.org

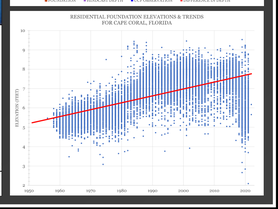
HazardAware is funded by: The National Academies of Sciences Engineering Medicine — Gulf Research Program — Grant #200010880

Perishable Flood Data Collection along Florida's New Forgotten Coast

Our team developed the Emergency Management Research Initiative (EMRI) to support disaster response and recovery by identifying operational gaps and opportunities to create new knowledge about societal needs through insightful analytics. As official federal data collections overlooked the city of Cape Coral, Florida, we collected perishable storm surge flood data (HWM) with support from UCF's Provost, providing the City and State of Florida a comprehensive map of flooding, with publication of analytical findings about differential impacts and inequities in assistance forthcoming.



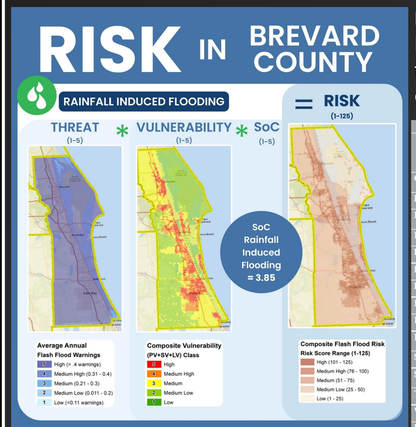




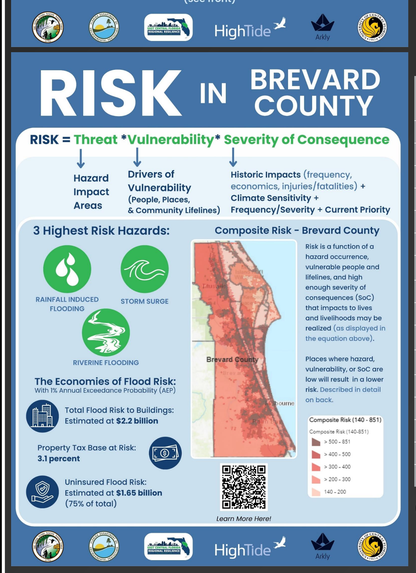
SUPPORTING EMERGENCY MANAGEMENT DECISION MAKING

SUPPORTING RISK BASED AND ACTIONABLE MITIGATION PLANNING

Risk = Threats * Vulnerabilities * Severity of Consequence



This process is repeated for all hazards resulting in a composite risk map (see front)



To learn more, visit www.hazardrisk.org

Historical Consequence = the sum of historical frequency, economic impacts, fatalities, and injuries from past disaster events standardized on a (1-5) scale

Brevard County Historical Consequence Scores by Hazard					
Hazard	Historical Frequency Score (1-5)	Historical Economic Impact Score (1-5)	Historical Fatality Score (1-5)	Historical Injury Score (1-5)	Historical Score (1-5)
Coastal	2.17	1.08	5	1.15	3.82
Drought	1	1	1	1	1
Flooding	1.67	1.74	1.13	1	1.8
Fog	1	1	1	1	1
Hail	1.41	1.04	1.02	1.01	1.25
Heat	1	1	1	1	1
Hurricane/Tropical Storm	1.7	5	1.41	2.52	4.46
Landslide	1	1	1	1	1
Lightning	3.72	1.05	4.34	2.56	5
Low Temperatures	1	1	1	1	1
Severe Storm/Thunderstorm	4.68	1.07	1.23	1.53	3.36
Sinkholes	1.12	1	1	1	1.06
Tornado	3.89	1.34	1.43	5	5
Wildfire	1.09	2.67	1	1.98	2.43
Wind	5	1.08	1.76	1.54	3.81
Winter Weather	1.26	1.04	1.05	1	1.18

Frequency/Severity = total loss/total number of events **standardized on a (1-5) scale**

Hazard	Historical Score (1-5)	Climate Sensitive (1-5)	Frequency / Severity (1-5)	Priority/Future Consequence Planning (1-5)	Composite SOC Score (5-20)	Severity of Consequences Score (1 – 5)
Coastal	3.82	5	1.01	2	11.83	3.48
Drought	1	5	1	4	11	3.21
Flooding	1.8	5	1.23	5	13.03	3.85
Fog	1	1	1	1	4	1
Hail	1.25	3	1.02	5	10.27	2.98
Heat	1	5	1	4	11	3.21
Hurricane/ Tropical Storm	4.46	5	2.19	5	16.66	5
Landslide	1	1	1	1	4	1
Lightning	5	3	1	5	14	4.16
Low Temperatures	1	1	1	1	4	1
Severe Storm/ Thunderstorm	3.36	5	1	5	14.36	4.27
Sinkholes	1.06	1	1	1	4.06	1.02
Tornado	5	3	1.02	1	10.02	2.9
Wildfire	2.43	5	5	4	16.43	4.93
Wind	3.81	3	1	1	8.82	2.52
Winter Weather	1.18	1	1.03	1	4.21	1.07

Current Priority = County specific prioritization of hazards links to previous planning efforts and moves these assessments towards becoming living documents that have impact/influence on the current assessment.

Climate Sensitivity = Each hazard in this assessment was appraised for its climate sensitivity through a literature review and scored on a (1-5) scale measuring its connection to current and future climate conditions.

Hazard	Climate Sensitivity Score (1-5)	Reference
Coastal Flood/ Sea Level Rise	5	https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter13_FINAL.pdf
Drought	5	Abatzoglou, J.T. and A.P. Williams, 2016: Impact of anthropogenic climate change on wildfire across western US forests. Proceedings of the National Academy of Sciences of the United States of America, 113 (42), 11770-11775. http://dx.doi.org/10.1073/pnas.1607171113
Earthquake	3	https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/
Extreme Cold	1	IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midgley, Eds. Cambridge University Press, Cambridge, UK and New York, NY, 1535 pp. http://www.climatechange2013.org/report/
Flash Flood	5	Mitsch, W.J. and J.G. Gosselink, 2007: Wetlands, 4th ed. Wiley, New York, 600 pp.
Flooding	5	Sweet, W.V. and J.J. Marra, 2016: 2015 State of U.S. Nuisance Tidal Flooding. Supplement to State of the Climate: National Overview for May 2016. National Oceanic and Atmospheric Administration, National Centers for Environmental Information, 5 pp. http://www.ncdc.noaa.gov/monitoring-content/sotc/national/2016/may/sweet-marra-nuisanceflooding-2015.pdf
Fog	1	https://aaqr.org/articles/aaqr-15-05-oa-0353
Hail	3	Mitsch, W.J. and J.G. Gosselink, 2007: Wetlands, 4th ed. Wiley, New York, 600 pp.
Heat	5	Allen, C.D., D.D. Breshears, and N.G. McDowell, 2015: On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene. Ecosphere, 6 (8), 1-55. http://dx.doi.org/10.1890/ES15-00203.1
Hurricane/ Tropical Storm	5	Smith, T. J., Robblee, M. B., Wanless, H. R., & Doyle, T. W. (1994). Mangroves, hurricanes, and lightning strikes. BioScience, 44(4), 256-262. http://dx.doi.org/10.2307/1312230 Doyle, T. W., Smith III, T. J., & Robblee, M. B. (1995). Wind damage effects of Hurricane Andrew on mangrove communities along the southwest coast of Florida, USA. Journal of Coastal Research, 159-168. http://www.jstor.org/stable/25736006
Lightning	3	Mitsch, W.J. and J.G. Gosselink, 2007: Wetlands, 4th ed. Wiley, New York, 600 pp.
Severe Storm/ Thunder Storm	5	Mitsch, W.J. and J.G. Gosselink, 2007: Wetlands, 4th ed. Wiley, New York, 600 pp.
Sinkholes	1	https://nhess.copernicus.org/preprints/nhess-2018-18/nhess-2018-18-SC1-supplement.pdf
Tornado	3	Mitsch, W.J. and J.G. Gosselink, 2007: Wetlands, 4th ed. Wiley, New York, 600 pp.
Wildfire	5	Abatzoglou, J.T. and A.P. Williams, 2016: Impact of anthropogenic climate change on wildfire across western US forests. Proceedings of the National Academy of Sciences of the United States of America, 113 (42), 11770-11775. http://dx.doi.org/10.1073/pnas.1607171113
Wind	3	Dale, V. H., Joyce, L. A., McNulty, S., Neilson, R. P., Ayres, M. P., Flannigan, M. D., ... & Wotton, B. M. (2001). Climate change and forest disturbances: climate change can affect forests by altering the frequency, intensity, duration, and timing of fire, drought, introduced species, insect and pathogen outbreaks, hurricanes, windstorms, ice storms, or landslides. BioScience, 51(9), 723-734. http://dx.doi.org/10.1641/0006-3568(2001)051[0723:ccafdi]2.0.co;2
Winter Weather	1	IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midgley, Eds. Cambridge University Press, Cambridge, UK and New York, NY, 1535 pp. http://www.climatechange2013.org/report/

EQUITY ASSESSMENTS ACROSS THE DISASTER SPECTRUM

Links between social vulnerability (inputs) and CDBG-DR Program Aid

We analyze two federal support programs: Community Development Block Grant – Disaster Recovery (CDBG-DR) home-owner programs for two Major Disasters in South Carolina (2015 SC Flood & 2016 Hurricane Matthew. Through a Rawlsian equity lens, we investigate differences in applicant's program "survivability" across the various milestones of each recovery program. Here, linking social vulnerability characteristics can help us better pinpoint where survivors need more help in the process.

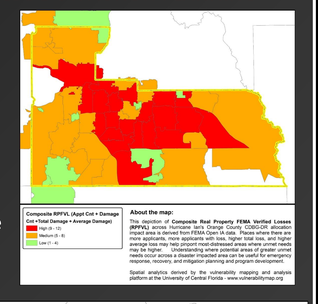
Program milestones	Definition	Variable description	Dependent Variables
Intake Complete	Applicant is registered for the program	Complete (1), Incomplete (0)	IntakeComplete (M1)
Eligibility Complete	Whether applicant is eligible or not to receive the grant	Eligible & In Review (1), Not Eligible & Not Started (0)	EligibilityComplete (M2)
Team Lead Review Complete	Review of the application	Complete (1), Not Started (0)	TeamLeadReviewComplete (M3)
Income Complete	Verification of applicant's income	Verified (1), Not Verified (0)	IncomeComplete (M4)
DOB Complete	Duplication of benefit	Complete (1), Case Manage Resubmitted, In Initial Review, Returned to Case Manager (0)	DOBComplete (M5)
Damage Complete	Level of damage	Complete (1), Incomplete (0)	DamageComplete (M6)
Environmental Review Complete	Environmental review	Complete (1), Incomplete (0)	EnvReviewComplete (M7)
Construction Complete	Whether construction is completed	Construction Complete (1), Others (0)	ConstructionComplete (M8)

Variables	Intake Complete	Eligibility Complete	Team Lead Review Complete	Income Complete	DOB Complete	Damage Complete	Env Review Complete	Construction Complete	*Frequency*
QBLACK	4.17%	-2.29%	-9.87%	5.35%				-4.15%	*5*
AGE_Appli	19.015	-5.717	-4.187	-2.123					*4*
QCVLUN	1.06%		-1.82%	1.18%				-0.88%	*4*
QFHH	-0.50%				-1.22%			-1.09%	*3*
QMOHO	1.39%			2.29%			-2.74%		*3*
QED12LES	0.63%		-1.89%					-0.63%	*3*
MHSEVAL	$7,622.65		$13,024.55					$8,237.45	*3*
QFAM					2.77%			1.98%	*2*
QRENTER					-2.61%		1.16%		*2*
QUNOCCHU	0.60%			1.11%					*2*
QPOVTY	0.67%							-1.49%	*2*
QFEMLBR	-0.56%				-1.19%				*2*
PERCAP					$778.29			$634.95	*2*
QNOAUTO		-0.60%						-0.83%	*2*
MEDAGE					1.249				*1*
QNATAM				-0.17%					*1*
QPUNIT	1.76%								*1*
QNRRES							0.08%		*1*
QFEMALE	-0.58%								*1*
QSSBEN	-0.89%								*1*
QRICH200K	0.37%								*1*
QSERV			2.35%						*1*
MDGRENT	$50.24								*1*
Frequency	*15*	*3*	*6*	*6*	*6*	*0*	*3*	*9*	

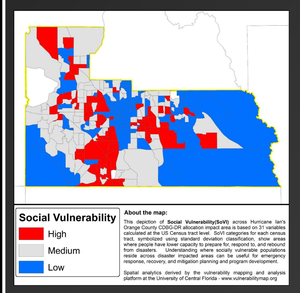
+ve => higher mean % who dropped
-ve => higher mean % who remained

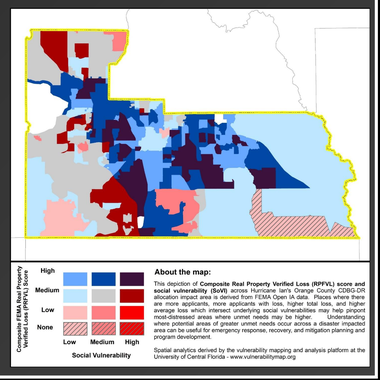
IMPACT ASSESSMENT AND SUPPORT OF CDBG-DR ACTION PLANNING

Composite Impacts = Moving beyond the total loss to account for all people who are suffering and asking for help creates a more realistic summary of impacts across Orange County.



Social Vulnerability = Implementing a holistic view of what makes people and communities vulnerable highlights where scare resources would be useful





Resulting Bivariate Map pinpointing where targeted interventions would be impactful and drive recovery

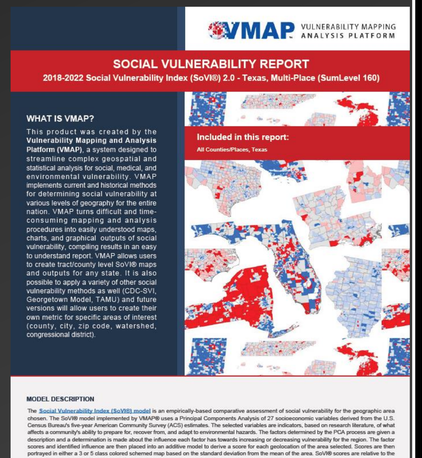
VMAP VULNERABILITY MAPPING ANALYSIS PLATFORM

The Vulnerability Mapping Analysis Platform (VMAP) turns complex socio-demographic, environmental, and medical data into applied tools for emergency and crisis management decision makers by utilizing the most appropriate scientific methods. Let VMAP help you measure and visualize disaster losses and human impacts through the lens of evidenced based vulnerability analysis.

Our recent release **enables users** to create vulnerability maps **for any city, place, tract, county, watershed, congressional district, or state for any year 2012 – 2022.**

Available social vulnerability models include:
- The seminal SoVI (Cutter et al. 2023)
- The Georgetown Approach (Cutter et al. 2000)
- The HRRC SVI (Van Zandt et al. 20xx
- The CDC SVI (Flannagan et al. 20xx)

To learn more visit www.vulnerabilitymap.org



RECENT PUBLICATIONS: (Junior Faculty Lead*, Student Lead†, Practitioner Lead‡)

Lawrence, K., Sweeney, M., Werder, E., Zuzak, C., Gall, M., Emrich, Christopher T., Cochran, F. , Deng, X., Christenbury, K., Buller, I., Jackson B., Engel, L., and D.P. Sandler. Residential natural hazard risk and adverse mental health outcomes. Accepted for publication in the Journal of Epidemiology (Impact Factor 4.9) in January 2024.

Schumann III, R.L., Butsic, V., Emrich, C.T., Schumann, R., Zhou, Y., Mockrin, M., Syphard, A., Whittaker, J., Price, O., C.J. Gaither, & S. Aksha. The intersection of social vulnerability and wildfire experience in the United States: key vulnerabilities and potential solutions (In Preparation). Accepted for publication in Natural Hazards (Impact Factor 2.254) in December 2023.

†Ali, J., Wahl, T., Enriquez, A.R., Rashid, M.M., Morim, J., Gall, M, and C.T. Emrich (2023). The role of compound climate and weather extreme events in creating socio-economic impacts in South Florida. Weather and Climate Extremes 100625 (Impact Factor 8.0) https://doi.org/10.1016/j.wace.2023.100625

†Meltzer, G. Y., Merdjanoff, A. A., Xu, S., Gershon, R., Emrich, C. T., & Abramson, D. M. (2023). Examining the effects of cumulative environmental stressors on Gulf Coast child and adolescent health. Population and Environment, 45(3), 21. (Impact Factor 4.283). https://doi.org/10.1007/s11111-023-00436-1

‡Mockrin, M.H., Schumann III, R.L., Whittaker, J., Johnson, C.J., Books, R.A., Syphard, A.D., Price, O. & C.T. Emrich. (2023). Creating fire-adapted communities through recovery: case studies from the United States and Australia. Journal of Extreme Events 235003 (Impact Factor NA). https://doi.org/10.1142/S2345737623500033