

### COURSE SYLLABUS

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Instructor:	Dr. Kevin Ash	Term:	Spring 2024
Office:	TUR 3128	Class Meeting Days:	Wednesday
Phone:	352-294-6956	Class Meeting Hours:	1:55 – 4:55 pm
Email:	kash78@ufl.edu	Class Location:	TUR 3006
Office Hours:	Mon & Tues, 3-4 pm; Thur, 10-11 am; or by appt	Course Credits:	3 hours

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#### I. Course Overview

In this course, students will learn fundamental concepts and widely used methodologies for assessment of hazard vulnerability using geospatial data and analysis techniques. They will benefit from assignments using ArcGIS Pro (primarily) and other geospatial and quantitative analysis software. This course will not use a simple hazard-by-hazard approach but will integrate perspectives from the physical and social sciences to identify and describe risk and vulnerability with empirical data and real-world examples. This unique course will provide critical training and experience for students interested in hazards geography, GIS, emergency management, risk communication, and urban planning, among many other applications.

The course begins by reviewing key concepts relevant for geospatial analysis of risk and vulnerability such as the definitions of these terms and practical issues such as geographic scale and the modifiable areal and temporal unit problems. Then, we will investigate how different types of hazards are represented spatially and how these differences make multi-hazard mapping and analysis challenging. We will then discuss the advantages and pitfalls of using casualty and economic loss datasets, before introducing students to the wide array of socioeconomic datasets frequently used in social vulnerability analyses. Students will learn several different approaches and methodologies for social vulnerability mapping and analysis and will learn how physical (risk) and social vulnerability analyses can be integrated into a single quantitative assessment. Students will also be exposed to literature on mapping resilience indices, as well as participatory mapping approaches for risk and vulnerability.

NOTE: This course is co-listed with GIS 6325 which is a graduate course. While the two courses will overlap and complete similar assignments and exams, undergraduate and graduate students will be evaluated on different bases. Graduate students will be required to contribute more frequently (including leading one class period) during the reading discussions, complete a longer and more rigorous final project paper, and deliver a longer and more comprehensive final project presentation.

#### II. Course Content Objectives

By the end of the course, students will:

- Discover how the concepts of risk and vulnerability are operationalized for geospatial analyses.
- Demonstrate understanding of how risk and vulnerability indices are constructed and mapped using a GIS and how the indices and maps should be interpreted
- Identify and use appropriate geospatial physical and socioeconomic datasets in risk and vulnerability analyses
- Compare and contrast different geospatial analytic methodologies used in risk and vulnerability analyses
- Apply basic and advanced geographic and geostatistical concepts in the context of disaster risk reduction efforts

### III. Student Learning Outcomes

Through the course assignments and exams, students will learn to:

- Define the terms risk and vulnerability and operationalize these concepts with empirical spatial data
- Perform mapping and assessment of physical hazard risks associated with a variety of hazard types using GIS and geospatial analysis techniques
- Understand how the modifiable areal and temporal unit problems, as well as different data smoothing techniques, can influence conclusions about risk and vulnerability in quantitative and geospatial analysis
- Work with data that contain margins of error and visualize uncertainty in maps
- Download, combine, and map secondary socioeconomic data in a social vulnerability index
- Analyze and map data using multivariate statistics
- Map social and physical data using dasymetric techniques
- Combine and map physical hazard and socioeconomic data for a comprehensive risk and vulnerability analysis
- Communicate analysis findings in written, verbal, cartographic, and graphical formats

### IV. Materials and Supplies: Computer

This course will be held in TUR 3006 for the Spring 2024 semester. Students should provide their own computer on which to participate in discussions on Canvas prior to class and work on GIS assignments during and outside of class. Any required software (such as ArcGIS Pro) will be available to students through UF Apps at <https://info.apps.ufl.edu> or through student licenses provided by the instructor.

### V. Required Texts and Useful Online Resources

There is no required textbook for this course. The instructor will assign readings on a weekly basis and these will be available via Canvas. Citations for the required readings are provided at the end of this document.

#### Policy for use of Artificial Intelligence (AI) Language Models

AI language models, such as ChatGPT, may NOT be used for the following course assignments: Reading Discussions and GIS Assignments. AI language models may be used in a limited fashion for the Final Project, with appropriate citation. Examples of appropriate use for the research project include editing of text written by the student for improving organization, word choice, and grammar, as well as recommendations for code or tools to use in GIS, spatial, and statistical analyses. If you are not sure whether you are using AI language models appropriately in the course, please discuss your situation with the instructor. Students are responsible for fact-checking any statements composed by AI language models. Examples for how to cite or report use of AI language models are available at: <https://ics.ifas.ufl.edu/media/icsifasufledu/docs/edis/EDIS-AI-Factsheet-v-1.pdf>

### VI. Course Format, Activities, and Basis for Evaluation

The class will meet once per week for a three-hour time block on Wednesdays from 1:55 pm to 4:55 pm. The three hour period will be a mix of lecture, discussion of assigned readings, and time to work on each week's GIS assignment. NOTE: The instructor will give the lectures live in TUR 3006 but will also record these lectures using Zoom and make them available via Canvas to all students in the class for study & review purposes only; these recordings are not to be distributed publicly or made available to anyone outside the course without the written permission of the instructor. To clarify: this is not a HyFlex course. Students are expected to attend class in TUR 3006 unless they have documented reasons for absence. The only exceptions to this are UF Online students who will participate remotely in all aspects of the course.

The camera will remain on the instructor during lecture recordings. Students are still encouraged to ask questions during the lectures. The best method for doing so is to log in to Zoom with cameras and microphones off on a laptop computer and pose questions using the chat window to avoid being heard or seen on the recordings.

#### Evaluation and Grading

**Class Participation & Reading Discussions:** Class participation will be evaluated based on two components. The first is attendance which will count for 5% of the final grade. Students are expected to attend class for each of the 15 class periods during the semester. Students may be excused from absences with appropriate documentation according to the university

policy (more information provided in Section IX below). The other 25% in class participation will be discussion of the weekly readings in written format on Canvas and verbally during class. Students will be required to post online their own summaries and critiques the day before class and discuss the papers further during class periods. An evaluation rubric is provided below.

*Rubric for Evaluation: Online Readings Summaries/Critiques*

*Task: Write a 300-500 word summary and critique of the weekly assigned readings and submit it via Canvas the before class. Consult the rubric below to make sure you include all required elements to receive full credit.*

*(Adapted from two sources: Solan & Linardopoulos 2011, [http://jolt.merlot.org/vol7no4/linardopoulos\\_1211.htm](http://jolt.merlot.org/vol7no4/linardopoulos_1211.htm); Reflection/Discussion Critique Rubric, <http://www.rcampus.com/rubricshowc.cfm?sp=yes&code=D97AAC&>.)*

<b>Evaluation Category</b>	<b>Standards for Excellent Work</b>	<b>Points</b>	<b>Instructor Comments</b>
<b>Summary of Key Concepts</b>	<ul style="list-style-type: none"> <li>-Demonstrate comprehension of key concepts from readings</li> <li>-Recognize &amp; define key concepts in summary</li> <li>-Use terms &amp; concepts appropriately in context</li> </ul>	/4	
<b>Evaluation &amp; Synthesis of Key Concepts</b>	<ul style="list-style-type: none"> <li>-Construct generalized judgments and/or arguments about key concepts in readings</li> <li>-Support arguments using specific instances or examples from the readings</li> </ul>	/6	
<b>Critique Strategies</b>	<ul style="list-style-type: none"> <li>-Employ one or more critique strategies such as:               <ul style="list-style-type: none"> <li>▪ Compare/contrast between readings</li> <li>▪ Deconstruction of language or logic</li> <li>▪ Identification of methodological shortcomings</li> </ul> </li> </ul>	/6	
<b>Writing &amp; Communication Proficiency</b>	<ul style="list-style-type: none"> <li>-Organize writing with clear structure:               <ul style="list-style-type: none"> <li>▪ Introduction</li> <li>▪ Body</li> <li>▪ Conclusion</li> </ul> </li> <li>-Avoid spelling, grammar, syntax, punctuation, or other writing errors</li> </ul>	/4	

**GIS Assignments:** There will be 9 GIS assignments which will amount to 50% of the final grade. GIS assignments will be due one week after they are assigned; any exceptions to this are noted in the course schedule and on Canvas.

**Final Project:** For the final project, students will use one or more of the GIS methods for analysis of hazard risk and vulnerability covered in the course to perform their own analysis for a location and hazard context of their choosing. The final project paper should be about 2000 words in length and include citations, data tables, and maps and graphs as appropriate. The class project will be worth 20% of the total grade. The majority of the points (15 out of the 20 percentage points) will be related to the paper which each student will write and turn in by April 30<sup>th</sup>. The remaining 5 percentage points will be for a 7-minute

presentation given on April 24<sup>th</sup>. Students will write a short project proposal that will be due March 27<sup>th</sup> and will receive constructive feedback and guidance about the proposed research from the instructor and via peer review with students in the course. More detailed instructions about the final project will be provided to students via Canvas and during class meetings.

Assignments and Exams	Percent of Final Grade
Participation & Reading Discussions	30%
GIS Assignments	50%
Final Project Presentation	5%
Final Project Paper	15%

Grading Scale (%)	
92.5 – 100	A
89.5 – 92.4	A-
86.5 – 89.4	B+
82.5 – 86.4	B
79.5 – 82.4	B-
76.5 – 79.4	C+
72.5 – 76.4	C
69.5 – 72.5	C-
66.5 – 69.4	D+
62.5 – 66.4	D
59.5 – 62.4	D-
< 59.5	E

VII. **Important Dates to Remember:** The due dates below are tentative and can be changed at the discretion of the instructor.

Drop/Add Ends:	Fri, Jan 12 <sup>th</sup> 2024
<b>Final Project Proposal Due</b>	<b>Wed, Mar 27<sup>th</sup> 2024</b>
Spring Break	Mon-Fri, Mar 4-8 <sup>th</sup> 2024
<b>Final Project Presentations</b>	<b>Wed, Apr 24<sup>th</sup> 2024</b>
Reading Days	Thurs-Fri, Apr 25-26 <sup>th</sup> 2024
<b>Final Project Paper Due</b>	<b>Tues, Apr 30<sup>th</sup> 2024</b>
Spring 2024 Grades Available on <a href="https://one.uf.edu/dashboard/">https://one.uf.edu/dashboard/</a>	Wed, May 8 <sup>th</sup> 2024

VIII. **Weekly Topic Schedule, Assignments, and Exams (Schedule is provisional and subject to change)**

Date	Day	Class Topics & Assignments	Read Before Class
Jan 10	Wed	Course Introduction; Assignment #1	None
Jan 17	Wed	Physical Hazard Risk Mapping; Assignment #2; #1 due	Trepanier et al. 2015; Allen et al. 2021
Jan 24	Wed	Multi-Hazard Risk Mapping; Assignment #3; #2 due	Buck and Summers 2020; Iglesias et al. 2021
Jan 31	Wed	Geospatial Analysis of Damage & Casualties; Assignment #4; #3 due	Al Rifat et al. 2021; Sharpe and Wolkin 2022
Feb 7	Wed	Demographic & Geospatial Data Sources; Visualizing Uncertainty; Assignment #5; #4 due	Wong & Sun 2013; Folch et al. 2016
Feb 14	Wed	Social Vulnerability Index: Deductive & Hierarchical Models; Assignment #6, #5 due	Cutter et al. 2000; Flanagan et al. 2011
Feb 21	Wed	Social Vulnerability Index: Inductive Models; Assignment #7; #6 due	Cutter et al. 2003; Rabby et al. 2019
Feb 28	Wed	Dasymetric Mapping & Social Vulnerability Analysis; Assignment #8; #7 due	Nelson et al. 2015; Tate et al. 2021
Mar 6	Wed	<b>Spring Break</b>	

Mar 13	Wed	Clustering Methods & Social Vulnerability Analysis; Assignment #9; #8 due	Rufat 2013; Wood et al. 2015
Mar 20	Wed	Introduction & Discussion of Final Project; Project Proposal Assignment; #9 due	None
Mar 27	Wed	Validity of Social Vulnerability Indices; Project Proposal due	Rufat et al. 2019; Spielman et al. 2020; Flanagan et al. 2021; Rufat et al. 2021
Apr 3	Wed	Risk/Vulnerability Integrated Analysis; Work on final project	Zuzak et al. 2022; Seeteram et al. 2023
Apr 10	Wed	GIS-Based Disaster Resilience Index; Work on final project	Cutter and Derakhshan 2018; Al Rifat and Liu 2020
Apr 17	Wed	Vulnerability Analysis Using Participatory & Qualitative GIS Methods; Work on final project	Yusuf et al. 2018; Sullivan-Wiley et al. 2019; Brandt et al. 2020
Apr 24	Wed	Student Project Presentations	None
Apr 30	Tues	<b>Final Project Papers Due by 11:59 pm on Apr 30</b>	

#### IX. Course Policies: Attendance, Make-Ups, and Grades

**Attendance:** Students are expected to attend each class period. Absences can be excused with proper documentation according to university policy. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

**Make-Up Exams and Assignments:** Requirements for make-up exams, assignments, and other work in this course are consistent with university policies that can be found at <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

**Examination Policies and Reading Days:** Course policies are consistent with University policies on during-term exams, final exams, reading days, and make-up exams. Students must notify the instructor as soon as possible in case of absence during an exam and provide documentation as to the reason for the absence. If deemed an excused absence, the student will be permitted a reasonable amount of time to make up the missed exam. More details can be found at <https://catalog.ufl.edu/UGRD/academic-regulations/examination-policies-reading-days/>.

**Grade Dissemination:** You can access your scores at any time using the Grade function in Canvas. The instructor will post grades within about one week of the due date of each assignment and the mid-term exam.

**Grading Policies for Assigning Grade Points:** Information on current UF grading policies for assigning grade points may be found at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

**Grades of "Incomplete":** The current university policy concerning incomplete grades will be followed in this course. An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which you have completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances and obtained agreement from the instructor and arranged for resolution of the incomplete grade. Instructors are not required to assign incomplete grades.

#### X. Course Policies: Technology and Media

**Email:** Each of you has a UF email address. It is vital that you maintain an active UF email account and that you **check it often**. This tentative syllabus is **subject to change**, and any changes will be transmitted to you via your UF email account and Canvas (see below). Students should email the instructor if they have questions about any of the lectures, readings, assignments, or exams. You should expect a response within about 24 hours during weekdays. On holidays or weekends, expect a response on the next business day. The instructor will reasonably expect similar time frames for responses to emails sent to students.

**Canvas:** Course materials such as lectures, readings, the syllabus, and assignment instructions will be available through Canvas (<https://elearning.ufl.edu>). You will also find all due dates and grades on Canvas. Students must activate their UF GatorLink account in order to use Canvas. If you need help learning how to perform various tasks related to this course or other courses that utilize Canvas, please consult the above webpage. You may also contact the UF Computing Help Desk at (352) 392-HELP(4357) or [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

**Online Course Evaluation:** Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing online evaluations via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

**Recordings and Notes:** It is not permitted to sell or distribute notes or recordings from this class without written consent of the instructor. Nor are students permitted to disseminate recordings of the instructor lecturing or post copies of assignments or exams on the internet.

**Zoom Presence and Recorded Sessions:** The instructor will record the lectures including both audio and video for students in the class to refer back and for enrolled students who are unable to attend live for various reasons. Students who participate on Zoom with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. Any private chat messages to the instructor only will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

## XI. Course Policies: Student Expectations

### **Disabilities Statement:**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

**Academic Honesty & Conduct Policy:** UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code." On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor code ([sccr.dso.ufl/process/student-conduct-code/](http://sccr.dso.ufl/process/student-conduct-code/)) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

## XII. Campus Resources for Students:

### **Academic Resources**

*E-learning technical support:* Contact the [UF Computing Help Desk](mailto:helpdesk@ufl.edu) at 352-392-4357 or via email at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

*Career Connections Center:* Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services at [career.ufl.edu/](http://career.ufl.edu/).

*Library Support:* <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

*Teaching Center:* Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring. <http://teachingcenter.ufl.edu/>

*Writing Studio:* 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. <http://writing.ufl.edu/writing-studio/>

*Student Complaints On-Campus:* [sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/](http://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/)

*On-Line Students Complaints:* [distance.ufl.edu/student-complaint-process/](http://distance.ufl.edu/student-complaint-process/)

### **Health and Wellness Resources**

*U Matter, We Care:* If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or visit [umatter.ufl.edu/](http://umatter.ufl.edu/) to refer or report a concern and a team member will reach out to the student in distress.

*Counseling and Wellness Center:* Visit <https://counseling.ufl.edu/> or call 352-392-1575 for information on crisis services as well as non-crisis services.

*Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or visit <https://shcc.ufl.edu/>.

*University Police Department:* Visit [police.ufl.edu/](http://police.ufl.edu/) or call 352-392-1111 (or 9-1-1 for emergencies).

*UF Health Shands Emergency Room / Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [ufhealth.org/emergency-room-trauma-center](http://ufhealth.org/emergency-room-trauma-center).

*COVID-19:* If you are experiencing COVID-19 symptoms, please use the UF Health screening system and follow the instructions on whether you are able to attend class. The instructor will give you a reasonable amount of time to make up work if you miss deadlines due to COVID-19 related health problems. Please consult the following links for more information:

- CDC Guidance on Coronavirus Symptoms: <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>
- UF Health COVID-19 Exposure & Symptoms Quick Reference Guide: <https://coronavirus.ufhealth.org/screen-test-protect/covid-19-exposure-and-symptoms-who-do-i-call-if/>

UF Guidance for Spring 2022 Semester: <https://coronavirus.ufl.edu/health-guidance/>

### **XIII. Assigned Readings Citations:**

Al Rifat, S.A., and W. Liu, 2020. Measuring Community Disaster Resilience in the Conterminous Coastal United States, *ISPRS International Journal of Geo-Information*, 9: 469.

Al Rifat, S.A., J.C. Senkbeil, and W. Liu, 2021. Assessing Influential Factors on Inland Property Damage from Gulf of Mexico Tropical Cyclones in the United States, *ISPRS International Journal of Geo-Information*, 10: 295.

Allen, M.J., T.R. Allen, C. Davis, and G. McLeod, 2021. Exploring Spatial Patterns of Virginia Tornadoes Using Kernel Density and Space-Time Cube Analysis (1960–2019), *ISPRS International Journal of Geo-Information*, 10: 310.

Brandt, K., L. Graham, T. Hawthorne, J. Jeanty, B. Burkholder, C. Munisteri, and C. Visaggi, 2020. Integrating sketch mapping and hot spot analysis to enhance capacity for community-level flood and disaster risk management, *The Geographical Journal*, 186: 198-212.

Buck, K.D., and J.K. Summers, 2020. Application of a multi-hazard risk assessment for local planning, *Geomatics, Natural*

*Hazards and Risk*, 11: 2058-2078.

Cutter, S.L., J.T. Mitchell, and M.S. Scott, 2000. Revealing the Vulnerability of People and Places: A Case Study of Georgetown County, South Carolina, *Annals of the American Association of Geographers*, 90(4): 713-737.

Cutter, S.L., B.J. Boruff, and W.L. Shirley, 2003. Social Vulnerability to Environmental Hazards, *Social Science Quarterly*, 84: 242-261.

Cutter, S.L., and S. Derakhshan, 2018. Temporal and spatial change in disaster resilience in US counties, 2010-2015, *Environmental Hazards*, DOI: <https://doi.org/10.1080/17477891.2018.1511405>.

Flanagan, B.E., E.W. Gregory, E.J. Hallisey, J.L. Heitgerd, and B. Lewis, 2011. A Social Vulnerability Index for Disaster Management, *Journal of Homeland Security and Emergency Management*, 8: 3.

Flanagan, B., E. Hallisey, J.D. Sharpe, C.E. Mertzluft, and M. Grossman, 2021. On the Validity of Validation: A Commentary on Rufat, Tate, Emrich, and Antolini's "How Valid Are Social Vulnerability Models?" *Annals of the American Association of Geographers*, 111: 4.

Folch, D.C., D. Arribas-Bel, J. Koschinsky, and S.E. Spielman, 2016. Spatial Variation in the Quality of American Community Survey Estimates, *Demography*, 53: 1535-1554.

Iglesias, V., A.E. Braswell, M.W. Rossi, M.B. Joseph, C. McShane, M. Cattau, M.J. Koontz, J. McGlinchy, R.C. Nagy, J. Balch, S. Leyk, and W.R. Travis, 2021. Risky Development: Increasing Exposure to Natural Hazards in the United States, *Earth's Future*, in press, <https://doi.org/10.1029/2020EF001795>.

Nelson, K.S., M.D. Abkowitz, and J.V. Camp, 2015. A method for creating high resolution maps of social vulnerability in the context of environmental hazards, *Applied Geography*, 63: 89-100.

Rabby, Y.W., M.B. Hossain, and M.U. Hasan, 2019. Social vulnerability in the coastal region of Bangladesh: An investigation of social vulnerability index and scalar change effects, *International Journal of Disaster Risk Reduction*, 41: 101329.

Rufat, S., 2013. Spectroscopy of Urban Vulnerability, *Annals of the American Association of Geographers*, 103: 505-525.

Rufat, S., E. Tate, C.T. Emrich, and F. Antolini, 2019. How Valid Are Social Vulnerability Models? *Annals of the American Association of Geographers*, 109: 1131-1153.

Rufat, S., E. Tate, C.T. Emrich, and F. Antolini, 2021. Answer to the CDC: Validation Must Precede Promotion. *Annals of the American Association of Geographers*, 111: em-vii-em-viii.

Seeteram, N.A., K. Ash, B.F. Sanders, J.E. Sanders, K.J. Mach, 2023. Modes of climate mobility under sea-level rise, *Environmental Research Letters*, 18: 114015.

Sharpe, J.D., and A.F. Wolkin, 2022. The Epidemiology and Geographic Patterns of Natural Disaster and Extreme Weather Mortality by Race and Ethnicity, United States, 1999–2018, *Public Health Reports*, 137: 1118–1125.

Spielman, S.E., J. Tuccillo, D.C. Folch, A. Schweikert, R. Davies, N. Wood, and E. Tate, 2020. Evaluating social vulnerability indicators: criteria and their application to the Social Vulnerability Index, *Natural Hazards*, 100: 417–436.

Sullivan-Wiley, K.A., A.G. Short Gianotti, and J.P. Casellas Connors, 2019. Mapping vulnerability: Opportunities and limitations of participatory community mapping, *Applied Geography*, 105: 47-57.

Tate, E., M.A. Rahman, C.T. Emrich, and C.C. Sampson, 2021. Flood exposure and social vulnerability in the United States,



*Natural Hazards*, 106: 435-457.

Trepanier, J.C., K.N. Ellis, and C.S. Tucker, 2015. Hurricane Risk Variability along the Gulf of Mexico Coastline, *PLoS ONE*, 10: e0118196.

Wong, D.W., and M. Sun, 2013. Handling Data Quality Information of Survey Data in GIS: A Case of Using the American Community Survey Data, *Spatial Demography*, 1: 3-16.

Wood, N.J., J. Jones, S. Spielman, and M.C. Schmidlein, 2015. Community clusters of tsunami vulnerability in the US Pacific Northwest, *Proceedings of the National Academy of Sciences*, DOI: <https://doi.org/10.1073/pnas.1420309112>.

Yusuf, J.E., P. Rawat, C. Considine, M. Covi, B. St. John, J.G. Nicula, and K.A. Anuar, 2018. Participatory GIS as a Tool for Stakeholder Engagement in Building Resilience to Sea Level Rise: A Demonstration Project, *Marine Technology Society Journal*, 52: 45-55.

Zuzak, C., M. Mowrer, E. Goodenough, J. Burns, N. Ranalli, and J. Rozelle, 2022. The national risk index: establishing a nationwide baseline for natural hazard risk in the US, *Natural Hazards*, 114: 2331-2355.