

GEOG/ENEC 437
SOCIAL VULNERABILITY TO CLIMATE CHANGE
FALL 2019
MWF 10:10-11:00AM, Carolina Hall 204

Instructor

Dr. Clark Gray
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Office: Carolina Hall 308
Office Hours: Monday 12-1pm, Wednesday 2:15-3:15pm, and Friday 11am-12pm, *no appointment needed*, as well as other times MWF by appointment.
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Course Homepage: Readings, assignments and grades will be posted on Sakai.

Required Software: Stata/IC is required and available as a 6-month rental for \$48 at <https://www.stata.com/order/new/edu/gradplans/student-pricing/>

Nature and Goals of the Course

How does climate change affect vulnerable human populations, both in the developing and developed worlds? The Intergovernmental Panel on Climate Change, among many other authors, has named climate social science of this type as a critical research need. We will attempt to answer a shared research question on this topic by drawing on the rapidly growing peer-reviewed literature in this area, as well as on a semester-long data analysis project in which we will use social and climate data from around the world. This work will culminate in a final project in which your analytical results will be written up in the style of an academic paper, with step-by-step feedback from me and your peers. If all goes well, we will produce publishable findings that will subsequently be included in a submission to an academic journal.

Structure of the Course

Class meetings will include a mix of lectures, labs and writing/discussion sections. In the first half of the course, we will mostly use a MWF discussion/lab/lecture rotation, and in the second half this will become a MWF writing/lab/flex-day rotation. Assignments will include weekly labs, presentations of the readings (to be rotated among students), writing assignments (in the second half of the class), and a final paper and presentation which will aggregate this work together. Grading will be based on these assignments plus class participation and short quizzes on the lectures and readings.

Grading

<u>Item</u>	<u>Percent</u>	<u>Notes</u>
Class participation	10%	Weekly participation in discussions, peer reviews and office hours
Weekly quizzes	10%	Eight short quizzes on the lectures and readings. Lowest dropped.
Presentation	5%	One short presentation on the readings
Labs	35%	Thirteen weekly lab assignments done on your laptop
Writing assignments	20%	Six short writing assignments
<u>Final project</u>	<u>20%</u>	<u>Final paper and presentation</u>
Total	100%	

The final grading scale will be set at the end of the semester based on the distribution of grades at that time. This scale will be at least as generous as the standard 10-point scale (e.g. >90 = A).

Late assignments will be docked one letter grade per class day late. If illness, a family emergency or a religious obligation will force you to miss an exam or turn in an assignment late, it is your responsibility to contact me **BEFORE** the exam or due date to make other arrangements. Otherwise I can't guarantee that a make-up will be available.

How to Succeed in This Course

- Every class meeting will be connected to a graded component (a lab, quiz or writing assignment, as well as participation), so it's important not to miss class. If you do need to miss class, please let me know ahead of time via email or follow up as soon as possible.
- Make use of office hours to get help on assignments and any issues with the class! This is an easy way to improve your grade.

Course Schedule: Dates are tentative with the exception of the final.

<u>Date</u>	<u>Activity</u>	<u>Content</u>	<u>Assignments</u>
Wed Aug 21	Welcome		
Fri Aug 23	Lecture 1	Study design	
Mon Aug 26	Discussion 1	Intro to climate change	Quiz 1
Wed Aug 28	Lab 1	Find and analyze background data	
Fri Aug 30	Lecture 2	Intro to Stata 1	
Wed Sept 4	Lab 2	Download survey data	Lab 1 due
Fri Sept 6	Lecture 3	Intro to Stata 2	
Mon Sept 9	Discussion 2	Vulnerability to climate change	Quiz 2
Wed Sept 11	Lab 3	Descriptive analysis of social data	Lab 2 due
Fri Sept 13	Lecture 4	Intro to Stata 3	
Mon Sept 16	Discussion 3	Health and climate change	Quiz 3
Wed Sept 18	Lab 4	Multivariate analysis of survey data	Lab 3 due
Fri Sept 20	Lecture 5	Intro to multivariate analysis	
Mon Sept 23	Discussion 4	Conflict and climate change	Quiz 4
Wed Sept 25	Lab 5	Download climate data	Lab 4 due
Fri Sept 27	Lecture 6	Intro to QGIS	
Mon Sept 30	Discussion 5	Agriculture and climate change	Quiz 5
Wed Oct 2	Lab 6	Extract climate data	Lab 5 due

Date			Activity	Content	Assignments
Fri	Oct	4	Lecture 7	TBD	
Mon	Oct	7	Discussion 6	Poverty and climate change	Quiz 6
Wed	Oct	9	Lab 7	Link survey and climate data	Lab 6 due
Fri	Oct	11	Discussion 7	Migration and climate change	Quiz 7
Mon	Oct	14	Discussion 8	Policy responses to vulnerability	Quiz 8
Wed	Oct	16	Lab 8	Descriptive analysis of climate data	Lab 7 due
Mon	Oct	21	Writing 1	Introduction	Draft 1
Wed	Oct	23	Lab 9	Climate-health analysis 1	Lab 8 due
Fri	Oct	25	Flex 1	Work on lab and writing	
Mon	Oct	28	Writing 2	Background	Draft 2, revised 1
Wed	Oct	30	Lab 10	Climate-health analysis 2	Lab 9 due
Fri	Nov	1	Flex 2	Work on lab and writing	
Mon	Nov	4	Writing 3	Methods	Draft 3, revised 2
Wed	Nov	6	Lab 11	Climate-health analysis 3	Lab 10 due
Fri	Nov	8	Flex 3	Work on lab and writing	
Mon	Nov	11	Writing 4	Results 1	Draft 4, revised 3
Wed	Nov	13	Lab 12	Climate-health analysis 4	Lab 11 due
Fri	Nov	15	Flex 4	Work on lab and writing	
Mon	Nov	18	Writing 5	Results 2	Draft 5, revised 4
Wed	Nov	20	Lab 13	TBD	Lab 12 due
Fri	Nov	22	Flex 5	Work on lab and writing	
Mon	Nov	25	Writing 6	Results 3	Draft 6, revised 5
Mon	Dec	2	Writing 7	Conclusions	Draft 7, revised 6
Wed	Dec	4	Wrap-up		Lab 13 due
Fri	Dec	13	Final Exam 8-11am: No early finals or make-ups.		Final project

Reading List

Discussion 1: Intro to climate change

Frame, D., Joshi, M., Hawkins, E., Harrington, L., de Roiste, M. (2017). Population-based emergence of unfamiliar climates. *Nature Climate Change* 7, 407–411.

Arnell, N.W., Brown, S., Gosling, S.N., Gottschalk, P., Hinkel, J., Huntingford, C., Lloyd-Hughes, B., Lowe, J.A., Nicholls, R.J., Osborn, T.J., Osborne, T.M. (2016). The impacts of climate change across the globe: a multi-sectoral assessment. *Climatic Change*, 134(3), 457-474.

Carleton, T. A., & Hsiang, S. M. (2016). Social and economic impacts of climate. *Science*, 353(6304), aad9837.

Discussion 2: Vulnerability to climate change

Ford, J. D., Pearce, T., McDowell, G., Berrang-Ford, L., Sayles, J. S., & Belfer, E. (2018). Vulnerability and its discontents: the past, present, and future of climate change vulnerability research. *Climatic Change*, 151(2), 189-203.

Formetta, G., & Feyen, L. (2019). Empirical evidence of declining global vulnerability to climate-related hazards. *Global Environmental Change*, 57, 101920.

Bassett, T. J., & Fogelman, C. (2013). Déjà vu or something new? The adaptation concept in the climate change literature. *Geoforum*, 48, 42-53.

Discussion 3: Health and climate change

Mora, C., Dousset, B., Caldwell, I.R., Powell, F.E., Geronimo, R.C., Bielecki, C.R., Counsell, C.W., Dietrich, B.S., Johnston, E.T., Louis, L.V., Lucas, M.P. (2017). Global risk of deadly heat. *Nature Climate Change* 7, 501–506.

Davenport, F., Grace, K., Funk, C., & Shukla, S. (2017). Child health outcomes in sub-Saharan Africa: A comparison of changes in climate and socio-economic factors. *Global Environmental Change*, 46, 72-87.

Cooper, M. W., Brown, M. E., Hochrainer-Stigler, S., Pflug, G., McCallum, I., Fritz, S., Silva, J & Zvoleff, A. (2019). Mapping the effects of drought on child stunting. *Proceedings of the National Academy of Sciences*, <https://doi.org/10.1073/pnas.1905228116>

Discussion 4: Conflict and climate change

Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *Science*, 341(6151), 1235367.

O’Loughlin, J., Linke, A. M., & Witmer, F. D. (2014). Effects of temperature and precipitation variability on the risk of violence in sub-Saharan Africa, 1980–2012. *Proceedings of the National Academy of Sciences*, 111(47), 16712-16717.

von Uexkull, N., Croicu, M., Fjelde, H., & Buhaug, H. (2016). Civil conflict sensitivity to growing-season drought. *Proceedings of the National Academy of Sciences*, 201607542.

Discussion 5: Agriculture and climate change

Challinor, A. J., Watson, J., Lobell, D. B., Howden, S. M., Smith, D. R., & Chhetri, N. (2014). A meta-analysis of crop yield under climate change and adaptation. *Nature Climate Change*, 4(4), 287.

Springmann, M., Mason-D’Croz, D., Robinson, S., Garnett, T., Godfray, H.C.J., Gollin, D., Rayner, M., Ballon, P. & Scarborough, P. (2016). Global and regional health effects of future food production under climate change: a modelling study. *The Lancet*, 387(10031), 1937-1946.

Hasegawa, T., Fujimori, S., Havlík, P., Valin, H., Bodirsky, B.L., Doelman, J.C., Fellmann, T., Kyle, P., Koopman, J.F., Lotze-Campen, H. & Mason-D’Croz, D. (2018). Risk of increased food insecurity under stringent global climate change mitigation policy. *Nature Climate Change*, 8(8), 699–703.

Discussion 6: Poverty and climate change

Hertel, T. W., Burke, M. B., & Lobell, D. B. (2010). The poverty implications of climate-induced crop yield changes by 2030. *Global Environmental Change*, 20(4), 577-585.

Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, 527(7577), 235.

Flatø, M., Muttarak, R., & Pelsler, A. (2017). Women, weather, and woes: The triangular dynamics of female-headed households, economic vulnerability, and climate variability in South Africa. *World Development*, 90, 41-62.

Discussion 7: Migration and climate change

Missirian, A., & Schlenker, W. (2017). Asylum applications respond to temperature fluctuations. *Science*, 358(6370), 1610-1614.

Nawrotzki, R. J., & Bakhtsiyarava, M. (2017). International climate migration: Evidence for the climate inhibitor mechanism and the agricultural pathway. *Population, Space and Place*, 23(4): e2033.

Hauer, M. E. (2017). Migration induced by sea-level rise could reshape the US population landscape. *Nature Climate Change*, 7: 321–325.

Discussion 8: Policy for climate vulnerability

Asfaw, S., Carraro, A., Davis, B., Handa, S., & Seidenfeld, D. (2017). Cash transfer programmes, weather shocks and household welfare: evidence from a randomised experiment in Zambia. *Journal of Development Effectiveness*, 9(4), 419-442.

Bertram-Huemmer, V., & Kraehnert, K. (2017). Does index insurance help households recover from disaster? Evidence from IBLI Mongolia. *American Journal of Agricultural Economics*, 100(1), 145-171.

Randell, H. (2016). The short-term impacts of development-induced displacement on wealth and subjective well-being in the Brazilian Amazon. *World Development*, 87, 385-400.