ENSP 399: Global Climate Change - Coastal Indicators

Meets: Fridays 10am-1pm, Spring 2015 Semester, Location: 0215 SYM

Instructors

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Course Description:
The goal of this course is for students to become familiar with challenges faced by coastal communities and ecosystems in the face of climate change and to learn about methods for measuring and monitoring coastal change, risks, and coastal resilience (the ability of ecosystems and human communities to survive and recover quickly from disturbances such as

hurricanes or coastal flooding). This will include an exploration of indicators which are used to measure concepts such as resilience or climate impacts that are multi-faceted and sometimes difficult to define and quantify. A main goal of this class is to help students develop skills important for most careers, including science policy. As such, this class is targeted towards upperclassmen. Prerequisites: None.

Learning Goals for the Class:
This course will focus on hands on experience to develop skills that are important for many professions including, but not limited to, science policy work. These skills include public speaking, memo writing, asking interesting, intelligent questions, rapid synthesis and distillation of key information, and developing talking points and quick "elevator" speeches for conveying information succinctly and clearly.

Most work opportunities do not involve working alone, but typically involve group efforts, therefore practice working in groups is excellent training for any career. This course will use group work fairly extensively throughout the semester and will require students to coordinate on assignments outside of class and to develop a group project together including a report and final presentation of that product.

In addition, this class will focus on coastal resilience and indicators. Indicators are measures of status, rates, and trend of physical, natural, systems and can be used for a range of purposes including supporting decision-making, communicating key concepts, and scientific inquiry. Often they are used as intermediaries between the science and policy communities, by translating scientific information in a way that is relevant to policy decisions.

By the end of the class students will be able to:

1. Write science policy memos intended to be briefing or decisional memos;
2. Write and present short (30-60 sec to 4-5 minute) speeches conveying key information to decision-makers;
3. Formulate insightful questions when listening to someone else's talk;
4. Dissect and explain the different parts of an indicator, including aggregate indicators and proxies;
5. Evaluate the visual presentation of indicators, including the strengths and weaknesses of the information presented in dashboards, score cards, and other visual representations of indicators;
6. Develop an indicator to address a specific coastal threat (such as hypoxia, sea level rise, ocean acidification, harmful algal blooms, habitat loss) or to help a particular community (such as native communities, elderly, extremely poor, or the very young);

Late Work Policy:
Any assignment that is turned in late will lose 10% per day it is late. Assignments are due at the beginning of class on day they are due unless otherwise specified. Thus an assignment that is turned in after class will be considered 1 day late. The student or the student groups are

expected to turn in assignments on time even if a student is unable to attend class for any reason. Rare exceptions will be considered on a case-by-case basis, consistent with university policies.

Resubmission policy:
For written assignments worth at least 10% of the grade, a student may request permission (once the grade is received) to address the comments, improve the assignment, and resubmit it for a potential maximum increase of 1 full grade in score (for example, if a student got a B-, then one would be able to potentially get as high as an A- on the resubmitted work). This option will not be available for the final report. We have a resubmission policy for this class because we recognize that many of the skills we are having students work on (such as memo writing) are brand new. Therefore, we want students to have the opportunity to revise assignments and improve the science policy skills we teach in this course. Revisions must be submitted by the next class period. Regrades may not be completed immediately; we will get to them as quickly as possible. Please make sure to mark at the top of any assignment needing regrading that it is "For Regrading."

Assignments:
There will be two memos assigned, two short “elevator” speeches, and two group assignments, and a group final project. The first group assignment will be to dissect one of the aggregate indicators (such as the Global Adaptation Index or the Social Vulnerability Index) and to explain it and to critique it in both a short memo and a group presentation. The second group assignment will be to look at different ways to visualize information (such as the Puget Sound Dashboard or the Chesapeake Bay Scorecard) and to explain it and suggest the most appropriate visualization approach to reach a specified target audience.

The final group project will be a comprehensive synthesis and research project to develop a coastal resilience indicator and visualization tool on a coastal threat such as nuisance flooding, storm surge flooding, ocean acidification, eutrophication and dead zones, drought, or harmful algal blooms. Students will research the topic as well as options for how communities can build resilience to the threat, and then students will develop an indicator (or suite of indicators) to help communities measure their resilience level and to determine how best they can become more resilient. The final project will include a final report as well as a class presentation on their indicator.

In addition to these specific assignments, there will be reading assignments and a reading journal will be required to accompany readings. For some weeks, questions or prompts for the reading will be assigned in addition to other reactions. Reading journal responses are due before class on Friday unless an earlier due date is specified, which may occur particularly when there are guest speakers.

Extra Credit:
There is an option for extra credit. Students can attend an event, either on campus or in DC, that relates to science policy or climate change, or coastal resilience. If it was not an event sent

out by the instructors, then an event must be pre-approved by the instructors to assure it will quality for extra credit. Students will attend, write a brief summary of the event, and give a 2 minute elevator speech to the class on the main take home messages from the event. This will be worth up to 1% of the total grade, and students can do this up to twice during the semester.

Class Participation:
Participation is absolutely key in this class which means attendance is absolutely critical. Activities will be hands on and virtually impossible to make up if students miss a class. And participation is crucial, it will be a substantial part of each student's final grade (15%).

Academic Integrity Policy (as stated by the UMD Honor Council):
The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit www.shc.umd.edu. To further exhibit your commitment to academic integrity, remember to sign the Honor Pledge on all examinations and assignments: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (assignment)."

Grading:
Participation: 15%
Reading Journal 5%
Memos: 10% each, total of 20%
Elevator speeches: 10% total, 5% each
Assignments: 25% (Aggregate Indicator project, Visualization assignment)
Final Project: 25% (5% Draft, 5% presentation, 15% report)

Course Schedule
(Note: Some guest speakers are still being confirmed and some readings are not yet posted, so some changes to this schedule will occur as the semester progresses.)

Date	Class Topic	Assignment/Activity	Readings
1/30	Syllabus and Course Intro. Threats Part I, Elevator Pitches		
2/6	Intro to Socio-environmental synthesis, Case Study on Coastal Resilience	Guest Speaker Dr. Cynthia Wei, SESYNC	Sandifer and Sutton-Grier, 2014 Case Study Palmer, 2012
2/13	Elevator pitches on coastal threats **No meeting in class**	**First memo due**	Barbier, 2014 Aerts, 2014 Cheung et al., 2012

			Cheung et al. 2013 Also one paper of your choosing
2/20*	Introduction to Indicators Part I (aggregate, proxies, etc) Discussion about how to develop questions for speakers	Revised draft of memo due (optional)	Rabalais et al., 2009
2/27	Introduction to Indicators Part II	Guest Speakers Maria Dillard and Theresa Geodeke, NOAA	New York Times article Environmental Performance Index Nature Climate Policy Article National Climate Indicator System Report NCIS Fact Sheet NCIS Policy Memo Wheeler et al. 2012 MEA Health Synthesis 2005 (up to PDF page 37)
3/6	Group presentations, final group project introduction	**Aggregate Indicators Assignment due** Guest Speaker Michael Savonis ICF International	
3/13	Visualizations of indicator information (dashboards, score cards, etc.)		Disaster Resilience: A National Imperative, 2012 Chapter 1 and 4
3/20	**Spring Break**		
3/27*	TBA	**Draft of Indicator Project Topic Due**	GMU Communication Papers
4/3	Final Group Project Work Day	In class pitch for idea	
4/10	Visualizations of Indicator Information, presentation review	**Presentation of class activity on visualization due**	Browse World Bank Indicators, NASA Indicators, EPA Indicators NOAA Climate Dashboard, Gain websites Spalding et al., 2014

			Aiken et al. 2014 Bouma et al., 2014 (read for 4/24)
4/17	Social (non-structural) Resilience	**Draft of Indicator Project Due**	Social Vulnerability Index Cutter, 1996 Cutter et al., 2003 (High level read) Disaster Resilience: A National Imperative, 2012 (Summary and Ch 1 & 4) Visualization Guidance Societal Indicators Workshop Report (Skim)
4/24*	Resilience and Natural Infrastructure, Jigsaw		Arkema et al., 2013 1. Zhang et al., 2012 Bayas et al., 2011 (Mike) 2. Gedan et al., 2010 Shepard et al., 2011 Moller et al., 2014 (Selena) 3. Rodriguez et al., 2014 Ferrario et al., 2014 (Laura) 4. Firth et al., 2014 Hanley et al., 2014 (Colin) 5. TNC Howard Beach report van Slobbe et al. 2013 (Jessica)
5/1	Field Trip to USGCRP or NOAA	**Decisional Recommendation Memo Due**	
5/8	**Final Presentations**	**Final Reports Due** Revised Memo 2 (optional) due	

*Indicates instructors will be able for a brown bag lunch with students after class to discuss anything related to science policy careers or professional development such as research, graduate school, career options, etc.

Required Readings

Arkema, K.K., Guannel, G., Verutes, G., Wood, S. A., Guerry, A., Ruckelshaus, A., … , Silver, J. M. (2013). Coastal habitats shield people and property from sea-level rise and storms. *Nature Climate Change. 3,* 913-918. doi:10.1038/NCLIMATE1944

Barbier, E.B. (2014). A global strategy for protecting vulnerable coastal populations. *Science, 345,* 1250-1251. doi: 10.1126/science.1254629

Bouma, T. J. , van Belzen, J. , Balke, T. , Zhu, Z., Airoldi, L. , Blight, A.J , …, Herman, P.M.J. (2014). Identifying knowledge gaps hampering application of intertidal habitats in coastal protection: Opportunities & steps to take. *Coastal Engineering, 87,* 147-157. http://dx.doi.org/10.1016/j.coastaleng.2013.11.014.

Cheung, W.W.L., Watson, R., Pauly, D. (2013). Signature of ocean warming in global fisheries catch. *Nature*, *497:,* 365-368. doi:10.1038/nature12156

Cheung, W.W.L., Sarmiento, J. L., Dunne, J., Frölicher, T.L., Lam, V. W. Y., Palomares, D., … , Pauly, D. (2012). Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems. *Nature Climate Change, 3,* 254-258. http://dx.doi.org/10.1038/nclimate1691

Cutter, S. L. (1996). Vulnerability to environmental hazards. *Progress in human geography*, *20*, 529-539.

Environmental Performance Index. What Are Indicators in Practice? <http://epi.yale.edu/what-are-indicators-practice.>

Feuer, A. "The Mayor's Geek Squad." *The New York Times*. The New York Times, 23 Mar. 2013. Web. 15 Jan. 2015. <http://www.nytimes.com/2013/03/24/nyregion/mayor-bloombergs-geek-squad.html?_r=0&adxnnl=1&adxnnlx=1421337867-tmnllNvpVVIEtDdNnZgalg>.

Firth, L.B., Thompson, R.C., Bohn, K., Abbiati, M., Airoldi, L., Bouma, T.J., … , Hawkins, S.J. (2014). Between a rock and a hard place: Environmental and engineering considerations when designing coastal defence structures, *Coastal Engineering*. *87,* 122-135. http://dx.doi.org/10.1016/j.coastaleng.2013.10.015.

Ferrario, F., Beck, M. W., Storlazzi, C. D., Micheli, F., Shepard, C. C., & Airoldi, L. (2014). The effectiveness of coral reefs for coastal hazard risk reduction and adaptation. *Nature communications*, *5*.

Gedan, K.B., Kirwan, M.L., Wolanski, E., Barbier, E. B., Silliman, B.R. (2010). The present and future of coastal wetland vegetation in protecting shorelines: answering recent challenges to the paradigm. *Climatic Change, 106,* 7-29. doi:10.1007/s10584-010-0003-7

Hanley, M.E., Hoggart, S.P.G., Simmonds, D.J., Bichot, A., Colangelo, M.A., Bozzeda, F., … , Thompson, R.C. (2014). Shifting sands? Coastal protection by sand banks, beaches and dunes, *Coastal Engineering, 87*. 136-146, ISSN 0378-3839. http://dx.doi.org/10.1016/j.coastaleng.2013.10.020.

Hazards and Vulnerability Research Institute. Social Vulnerability index for the United States - 2006-10. <http://webra.cas.sc.edu/hvri/products/sovi.aspx.>

Kenney, M.A, Janetos, A.C, et. al, National Climate Indicators System Report, National Climate Assessment and Development Advisory Committee, 2014.

Laso Bayas, J.C., Marohn, C., Dercon, G., Dewi, S., Piepho, H. P., Joshi, L., … , Cadisch, G. (2011). Influence of coastal vegetation on the 2004 tsunami wave impact in west Aceh. *Proceedings of the National Academy of Sciences.* 108(46), 18612–18617. doi: 10.1073/pnas.1013516108

Möller, I., Kudella, M., Rupprecht, F., Spencer, T., Paul, M., van Wesenbeeck, B. K., ... & Schimmels, S. (2014). Wave attenuation over coastal salt marshes under storm surge conditions. *Nature Geoscience*, *7*(10), 727-731. doi:10.1038/ngeo2251

The National Academic Press. Disaster Resilience: A National Imperative (2012). <http://www.nap.edu/catalog/13457/disaster-resilience-a-national-imperative.>

Rabalais, N. N., Turner, R. E., Díaz, R. J., & Justić, D. (2009). Global change and eutrophication of coastal waters. *ICES Journal of Marine Science: Journal du Conseil*, *66*(7), 1528-1537. doi: 10.1093/icesjms/fsp047

Rodriquez, A.B., Fodrie, J.F., Ridge, J.T., Lindquist, N. L., Theuerkauf, E. J., Coleman, S.E., Grabowski, J.H., Brodeur, M.C., Gittman, R.K., Keller, D. A., Kenworthy, M. D. (2014). Oyster reefs can outpace sea-level rise. *Nature Climate Change*, *4*, 493–49. doi: 10.1038/NCLIMATE2216

Sandifer, P. A. & Sutton-Grier, A. E. (2014). Connecting stressors, ocean ecosystem services, and human health. *Natural Resources Forum*, *38,* 157–167. doi: 10.1111/1477-8947.12047

Shepard, C.C., Crain C.M., Beck, M.W., (2011). The Protective Role of Coastal Marshes: A Systematic Review and Meta-analysis. *PLoS ONE*, *6*(11). DOI: 10.1371/journal.pone.0027374

Spalding, M.D., Ruffo, S., Lacambra, C., Meliane, I., Hale, L.Z., Shepard, C.C., Beck, M.W. (2014). The role of ecosystems in coastal protection: Adapting to climate change and coastal hazards. *Ocean & Coastal Management*, *90*, 50-57.http://dx.doi.org/10.1016/j.ocecoaman.2013.09.007

Victor, D. G., & Kennel, C. F,. Climate Policy: Ditch the 2 °C Warming Goal." *Nature.com*. Nature Publishing Group, 01 Oct. 2014. Web. 15 Jan. 2015. <http://www.nature.com/news/climate-policy-ditch-the-2-c-warming-goal-1.16018>.

Zhang, K., Liu, H., Li, Y., Xu, H., Shen, J., Rhome, J., Smith, T.J., 1 May 2012. The role of mangroves in attenuating storm surges. *Estuarine, Coastal and Shelf Science*, *102–103*, 11-23.http://dx.doi.org/10.1016/j.ecss.2012.02.021