

Environmental Hazards

Spring 2018

Thursdays, 11:10 AM to 2:00 PM – HN 1028

Undergraduate PGEOG 36300

Graduate PGEOG 70554

Department of Geography
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Course Description: On November 1st, 1755, Lisbon was devastated by one of the deadliest earthquakes in centuries. Twenty-meter high tsunamis swept the city, annihilating at least 60,000 people. From Greenland to the British Isles, to Scandinavia, Morocco, Spain, and the Caribbean islands, millions of people witnessed this unprecedented telluric event. Such was its impact that Europeans began to see Nature as an unstable and hazardous agency, driving the foundations of seismology. Through similar cases such as the Tambora volcanic eruption in Indonesia, the Tunguska comet in Siberia, and the Chernobyl nuclear accident in the former Soviet Union, this course will introduce you to some of the main geophysical/technological phenomena that create these environmental hazards. You will acquire a solid knowledge of the tectonic system, earthquakes, volcanoes, landslides, floods, severe weather events such as hurricanes and tornadoes, droughts, global warming, coastal processes such as erosion, cliff recession, sea-level rise, extraterrestrial impacts and extinctions as well as technological catastrophes such as dam failures, oil spills, and nuclear power station accidents. You will hone your critical-thinking skills as you learn to connect natural and manmade disasters to their cultural, technological, socio-economic, political, and gendered values. Ecological disasters, as you will see, do not equally impact every population or socio-economic group. Minorities, indigenous groups, and the poor are often exposed to the highest risks.

Course Objectives:

1. This course is designed to introduce you to the local, regional, national, and global implications of geophysical processes and anthropogenic activities that cause or have the potential to generate hazardous conditions in the ecosystems.
2. You will study how local, regional, national, and international organizations have responded to hazardous situations and thereby learn about mechanisms of predicting, monitoring, preventing, and remediating potential environmental or technological risks.
3. You will be guided in forming an independent study on environmental/technological hazards at the local, regional, national, or international levels to enhance your perception of the important role of our collective responsibility towards a sustainable future.

Expected Learning Outcomes:

A. Course-Specific Learning Outcomes:

1. Think critically about the complexities of the planet Earth, especially the intersections between physical and human phenomena.
2. Analyze the planet as a complex structure and be able to comprehend the ways in which your immediate environments are connected to both local and distant ecologies.
3. Examine preconceived notions about boundaries of all sorts, including social, political, and geographical ones. Consider the social construction of divisions between humans and non-humans.

You will be assessed through your participation in class discussion, essays, and Blackboard responses.

B. General Education Learning Outcomes:

1. Communication Skills: You will be able to write, read, listen and speak critically and effectively. Your ability to speak and listen effectively will be assessed through your participation in class discussions. Your ability to read critically will be assessed by your comments on course readings. Writing skills will be assessed through essays as well as regular responses on Blackboard covering lectures, readings, and class discussions.
2. Scientific Reasoning and Social and Behavioral Sciences: You will be able to apply the concepts and methods of the natural and social sciences. Your ability to apply concepts and methods of sciences will be measured via class discussions, essays, and responses on Blackboard.
3. Information and Technological Literacy: You will be able to collect, evaluate and interpret information and effectively use information technologies.
4. Values: You will be able to make informed decisions based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.

Readings:

Required text (textbook): Nicholas K. Coch. "Geohazards: Natural and Human" (any edition). Prentice Hall: Englewood Cliffs, New Jersey. ISBN: 0-02-322992-6. Available at Hunter online bookstore at <http://hunter.textbookx.com/institutional>.

The course will include assigned readings that are available through articles, texts, chapters, films, and audios. The reference information of these materials (e.g. website addresses) is located in a document entitled "Readings" in the section "Course Materials" on Blackboard. Students are also encouraged to seek related and current sources beyond cited materials.

Assignments:

Depending on your status as undergraduate or graduate, you will be expected to complete the following assignments:

Undergraduate Students

1. Final research paper
 - a. 10 pages
 - b. at least 5 references
2. Research paper proposal (2 pages)
3. Mid-term exam: required
4. Final exam: required

Graduate Students

1. Final research paper
 - a. between 15 and 20 pages
 - b. at least 10 references
2. Research paper proposal (3 pages)
3. Abstract of the research paper:
Extra-credit (250 words plus keywords)
4. Oral presentation of your research paper

(10 minutes)

5. Mid-Term exam: Required

6. Final exam: Required

7. Meetings outside the class

(required at least once)

These assignments are described in detail in “Assignments Description” located in “Course Materials” on Blackboard.

Evaluation:

1. Undergraduate student grades will be based upon the following:

	Percentage of Final Grade
Research paper proposal	15%
Final Research Paper	35%
Mid-term exam	20%
Final exam	20%
Participation in discussion of assigned readings	10%

2. Graduate student grades will be based upon the following:

	Percentage of Final Grade
Research paper proposal	15%
Final Research Paper	40%
Oral Presentation of your research paper	10%
Mid-term exam	15%
Final exam	15%
Participation in discussion of assigned readings	5%
Abstract of the research paper	(extra-credit 5%)

Final letter grades will be assigned based on the CUNY grading policy that can be found in the online undergraduate catalog available at: <http://catalog.hunter.cuny.edu/>.

Course Policies:

Attendance:

I will take attendance at every class meeting. You should arrive in class on time and stay for the entire session. If you will miss class for any reason, you should discuss this with me ahead of time. You are responsible for any material you may miss. Poor attendance and tardiness will be factored into the participation component of your grade.

Incompletes:

I do not give incompletes (IN) except under the most extraordinary and documented medical emergencies. No late assignments will be accepted. Without a valid medical excuse, you will receive a grade of zero (0) on any assignment missed. If, for a valid medical emergency, you do miss an assignment, you must contact me within 48 hours of the missed assignment and present acceptable documentary evidence for your absence. At the time of the request, you must also

complete a Contract to Resolve an Incomplete Grade in consultation with me. We will agree on what needs to be completed and when it will be due and, if you meet the mutually agreed upon conditions, your course grade will be recomputed and a new grade, if appropriate, will be submitted. I will allow only one semester in which you can resolve the IN/FIN. After that time no request will be considered. The contract form is available in the Department of Geography office, HN 1006, during normal business hours.

To receive a CR/NC you must have completed all the course requirements and have requested the CR/NC option no later than the last scheduled lecture. If you choose this option, then all grades above 70% will be assigned CR and 69.9% and below will be assigned NC unless you choose the assign D option for grades between 60 and 69.9.

Classroom Electronics Use:

I permit the use of laptops and tablets **ONLY** for the purpose of taking notes during lecture and discussion. All other personal electronics should be turned off or set to silent before entering the classroom. Absolutely no texting is allowed during class. Any use of electronics beyond their permitted use is a disruption to the class and will be treated accordingly.

Hunter College Policy on Academic Integrity:

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. Plagiarism, dishonesty, or cheating in any portion of the work required for this course will be punished to the full extent allowed according to Hunter College. Being in college requires discipline, collegiality, and overall honesty.

Although knowledge is an accumulation of ideas from different people and epochs that you can use, you have to do so under certain conditions. If you are going to use another's ideas you have to identify their names and works. If you don't, it is called 'plagiarism,' and that is illegal.

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations of the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors.

ADA Policy:

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of Accessibility, located in Room E1124, to secure necessary academic accommodations. For further information and assistance, please call: (212-772-4857)TTY or (212-650-3230).

Students requiring special consideration during the exams must make arrangements with the Office of Accessibility and tell your instructor of the arrangements.

Hunter College Policy on Sexual Misconduct:

“In compliance with the CUNY Policy on Sexual Misconduct, Hunter College reaffirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

- a. **Sexual Violence:** Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College’s Public Safety Office (212-772-4444).
- b. **All Other Forms of Sexual Misconduct:** Students are also encouraged to contact the College’s Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link:

<http://www.cuny.edu/about/administration/offices/la/Policy-on-Sexual-Misconduct-12-1-14-with-links-pdf>

Schedule of Topics and Assignments*

*Except for changes that substantially affect implementation of the evaluation statement, this syllabus is a guide for the course and is subject to revision by the instructor. Any changes will be announced in advance.

Course Contents and Calendar:

Part I: Introduction and the Concept of Hazard

Week 1 (Feb. 1st): Introduction to the Course:

1. Syllabus presentation and the description of the assignments
2. الحسن بن الحسن بن الهيثم، أبو علي، (Alhazen), René Descartes, and the scientific method.
3. What is a Hazard?
4. Hazard management and environmental principles

Required Materials:

- Bradford, Alina (2015). “Science & the Scientific Method: A Definition.” *Livescience* (March 30). Available at <http://www.livescience.com/20896-science-scientific-method.html>
- Chapter 1: “The Geologic Hazards of Living on Earth” (Pages 1-3) in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)

Part II: Hazards, Nature, and the Ecological Conception of the risk/hazard:

Week 2 (Feb. 8th):

1. Hazard: myths, science, and perception
2. What is so-called Nature?

3. Nature, and historical visions of Hazards:

From the Scientific Revolution's Mechanical view to the Gaia Theory

4. Science, Knowledge, and Perception

Required materials:

- “Readings on Nature” (section that analyzes Raymond William’s “Ideas of Nature” by Shannon...
- Pages 25-36, Chapter 2 “Foods, Fossils, and Heresies” in “Evolution of the Earth” (Sixth edition) by Donald R. Prothero and Robert H. Dott, Jr. (2002) (posted on Blackboard).
- Noah’s Ark in “Ten Ancient Stories and the Geological Events That May Have Inspired Them.” *Smithsonian.com* (April 4, 2014) by Sarah Zielinski Available at <http://www.smithsonianmag.com/science-nature/ten-ancient-stories-and-geological-events-may-have-inspired-them-180950347/>
- The Lisbon Earthquake in “The Engines of Our Ingenuity: No. 1964: Lisbon Earthquake” by Rob Zaretsky. Available at <http://www.uh.edu/engines/epi1964.htm>
- Kaufman, Leslie (2012). “Wind Turbines and Health Hazards.” *The New York Times* (Jan. 18). Retrieved Jan. 22, 2017 from <https://green.blogs.nytimes.com/2012/01/18/wind-turbines-and-health-hazards/>
- Slovic (1987). “Perception of Risk.” *Science*, Vol. 236, issue 4799 (April 17), pp.: 280-285 (posted on Blackboard)

PART III: Earth’s Internal and External Structure, Volcanism, and Earthquakes

Week 3 (Feb. 15th): Rocks, Tectonic Plates, and Volcanism

1. Rocks, their typology, cycle, and structure
2. Earth’s internal structure and tectonic plates
3. Volcanism and its hazards

Cases of volcanism:

- Vesuvius, Italy (79)
- Tambora, Indonesia (1815)
- Eyjafjallajökull eruption (2010)

Required Materials:

- “A Day in Pompeii - Full-length animation” (video). Available at https://www.youtube.com/watch?v=dY_3ggKg0Bc
- British Geological Service (2016). “Eyjafjallajökull eruption, Iceland | April/May 2010.” Available at http://www.bgs.ac.uk/research/volcanoes/icelandic_ash.html
- Chapter 2, “Earth’s Interior,” and chapter 4, “Volcanic Hazards,” in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)
- Evans, Robert (2002). “Blast from the Past.” *Smithsonian Magazine* (July). Available at <http://www.smithsonianmag.com/history/blast-from-the-past-65102374/?no-ist=&page=3>

Further materials:

- Herzog, Werner (2016). “Into the Inferno.” (Film) (watch on your own)

Week 4 (Feb. 22nd): Earthquake Dynamics:

1. Earthquakes and their mechanics
2. Tsunamis
3. Fracking technologies and earthquakes

Cases of earthquakes:

- Mexico D.F. earthquake (2017)
- Oklahoma, gas-fracking and earthquakes

Required Materials:

- Agren, David, Lakhani, Nina, Carroll, Rory, and Jones, Sam (2017). “At least 225 dead after powerful earthquake hits central Mexico” *The Guardian* (Sep. 20). Available at <https://www.theguardian.com/world/2017/sep/19/mexico-city-earthquake-anniversary-1985>
- Chapter 5, “Earthquake Hazards” in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)
- Lafrance, Adrienne (2014). “Man-Made Earthquakes Are Changing the Seismic Landscape” *The Atlantic* (August 8). Available at <http://www.theatlantic.com/technology/archive/2014/08/man-made-earthquakes-are-altering-the-geologic-landscape/372243/>

Part IV: Climate Change: Facing the Unknown

Week 5 (March 1st):

1. What is *that* so-called Climate Change and Global Warming?
2. Past Climates
3. Causes of Climate Change
4. “A Chinese Hoax”? *Trumpism*, and Exxon Mobil knew it

Required Materials:

- Chapter 16: “Climate Changes: Past and Future.” *Understanding Weather and Climate* (5th Edition). Edward Aguado and James E. Burt
- Goldenberg, Suzanne (2015). “Exxon knew of climate change in 1981, email says – but it funded deniers for 27 more years” *The Guardian* (July 8). Retrieved January 12, 2017 from <https://www.theguardian.com/environment/2015/jul/08/exxon-climate-change-1981-climate-denier-funding>
- Won, Edward (2016). “Trump Has Called Climate Change a Chinese Hoax. Beijing Says It Is Anything But.” *The New York Times* (Nov. 18). Available at <https://www.nytimes.com/2016/11/19/world/asia/china-trump-climate-change.html>

Further materials:

- Balog, James (2013). “Extreme Ice.” *NOVA* [Documentary] (watch on your own)

-Paper Proposal

Week 6 (March 8th): Some of the Known Consequences

1. Sea Level Rise: Causes, consequences, and management strategies
Cases: Rotterdam, Netherlands, the North Sea, NYC, and others
2. Climate Change and extreme weather: Jet Stream and heatwaves
3. Climate Change/Environmental Refugees

Required materials:

a. For Sea level rise in general, see:

- NASA (2018). “Sea Level.” Available at <https://climate.nasa.gov/vital-signs/sea-level/>
- NOAA (2017). “Climate Change: Global Sea Level.” Available at <https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>

b. For Rotterdam, the Netherlands, North Sea, NYC, and others:

- Goodell, Jeff (2017). "Rotterdam has learned to cope with rising seas. Here's how." Available at <https://www.vox.com/energy-and-environment/2017/11/15/16651460/rotterdam-climate-change-sea-level-rise>
- Hall, Alexander (2013). "The North Sea Flood of 1953" in *Arcadia*, no. 5. Available at <http://www.environmentandsociety.org/arcadia/north-sea-flood-1953>
- Tam, Laura (2009). "Strategies for Managing Sea Level Rise." Available at <http://www.spur.org/publications/urbanist-article/2009-11-01/strategies-managing-sea-level-rise>
- "The Big U." Available at <http://www.rebuildbydesign.org/our-work/all-proposals/winning-projects/big-u>

c. For Climate Change and extreme weather, see:

- The Guardian* (2017). "Climate change made Lucifer heatwave far more likely, scientists find" <https://www.theguardian.com/world/2017/sep/27/climate-change-made-lucifer-heatwave-far-more-likely-scientists-find>
- ScienceDaily* (Jan. 18, 2018). "Jet stream changes since 1960s linked to more extreme weather." Available at <https://www.sciencedaily.com/releases/2018/01/180112091209.htm>

D. For Climate Change/Environmental Refugees:

- Taylor, Matthew (2017). "Climate change 'will create world's biggest refugee crisis'." *The Guardian* (Nov. 20. Available at <https://www.theguardian.com/environment/2017/nov/02/climate-change-will-create-worlds-biggest-refugee-crisis>

Week 7 (March 15th): Extreme Weather and Wild Fires:

1. Hurricanes and their dynamics

Cases:

- Galveston, Texas (1900)
- Katrina, New Orleans (2005)
- 2017 hurricane season: Harvey/Irma/Jose/Maria hurricanes

2. Tornadoes

3. Wild Fires:

Case: 2017 season, The Pacific Northwest and Los Angeles area

Required materials:

a. For hurricanes, see:

- Astor, Maggie (2017). "The 2017 Hurricane Season Really Is More Intense Than Normal." *The New York Times* (Sep. 19). Available at <https://www.nytimes.com/2017/09/19/us/hurricanes-irma-harvey-maria.html>
- Chapter 16: "Severe Weather Hazards" in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)
- NOAA (2013). "The Galveston Hurricane of 1900." Available at <http://oceanservice.noaa.gov/news/features/sep13/galveston.html>

b. For tornadoes, check:

- Chapter 16: "Severe Weather Hazards" in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)

c. For wild fires, see:

- Chapter 16, "Wild Fires" (posted on Blackboard).

- NASA (2017). "Smoke and Fires Light Up Pacific Northwest." Available at <https://www.nasa.gov/image-feature/goddard/2017/smoke-and-fires-light-up-pacific-northwest>
- The New York Times*. "Where the Fires Are Spreading in Southern California." Available at <https://www.nytimes.com/interactive/2017/12/06/us/southern-california-wildfires.html>

Week 8 (March 22nd): Environmental/Technological Hazards 1:

1. Dams and hazards: Failures, Safety, and Infrastructure

Cases:

- a. The Oroville Dam, California
- b. Guajataca Dam, Puerto Rico
- c. Addick and Barker Dams/reservoirs, Houston

2. Nuclear power stations:

Case: Chernobyl, former USSR (1986)

Required materials:

a. For dams, see:

- Mufson, Stephen (2017). "Failing Puerto Rico dam that endangers thousands not inspected since 2013." *The Washington Post* (Sep. 26). Available at https://www.washingtonpost.com/business/economy/failing-puerto-rico-dam-that-endangers-thousands-not-inspected-since-2013/2017/09/26/cfd26272-a225-11e7-b14f-f41773cd5a14_story.html?utm_term=.75eb75d949d9
- Pupovac, Jessica (2015). "Aging and Underfunded: America's Dam Safety Problem, In 4 Charts." *NPR*, WNYC Radio (Oct. 11). Available at <http://www.npr.org/2015/10/11/447181629/aging-and-underfunded-americas-dam-safety-problem-in-4-charts>
- Satija, Neena and Collier, Kiah (2017). "Houston officials let developers build homes inside reservoirs. But no one warned buyers." *The Texas Tribune*. Available at <https://apps.texastribune.org/harvey-reservoirs/>
- Vartabedian, Ralph (2018). "Human error played a role in Oroville Dam spillway failure, report finds." *Los Angeles Times* (Jan. 5). Available at <https://www.youtube.com/watch?v=C0EgzJ0KGxg>

b. For nuclear reactors, see:

- Lallanilla, March (2013). "Chernobyl: Facts About the Nuclear Disaster." *Livescience* (Sept. 25). Available at <http://www.livescience.com/39961-chernobyl.html>

March 24th: WALKING TOUR – See Blackboard for details.

Week 9 (March 29nd):

-MID-TERM

-Discussion about the Final Paper

Week 10: SPRING RECESS: From March 30th to April 8th

Week 11: (April 12th): NO CLASS

Week 12: (April 19th): Environmental/Technological Hazards 2:

1. Oil Spills:

Cases:

- Saddam Hussein's oil well burning strategy (1991)
- The Deep Water Horizon disaster (2010)

2. The electric grid and blackouts:

Case: The Northeast blackout (August 2003)

3. Invasive species and GMOs:

Case: Monsanto versus Percy Schmeiser

Required materials:

- Chartsbin.com (2011). "The Largest Oil Spills in History, 1901 to Present." Retrieved Jan. 22, 2017 from <http://chartsbin.com/view/mgz>
- Democracy Now* (2010, Sept. 17). "Percy Schmeiser vs Monsanto: The Story of a Canadian Farmer's Fight to Defend the Rights of Farmers and the Future of Seeds." Available at https://www.democracynow.org/2010/9/17/percy_schmeiser_vs_monsanto_the_story
- Environmental Pollution Centers (2017). "Oil Spill Pollution." Available at <https://www.environmentalpollutioncenters.org/oil-spill/>
- "How Does the Power Grid Work?" (Video). Available at <https://www.youtube.com/watch?v=IZz4sR5vfeo>
- Minkel, JR. (2008). "The 2003 Northeast Blackout--Five Years Later." *Scientific American* (Aug.13). Available at <https://www.scientificamerican.com/article/2003-blackout-five-years-later/>
- Westervelt, Eric (2003). "Iraq War Fear: The Burning Fields." *NPR*. Available at <https://www.npr.org/templates/story/story.php?storyId=988641>

Further materials:

- The New York Times* (n. d.). "When the Oil Fields Burned" <https://www.nytimes.com/interactive/2016/04/08/sunday-review/exposures-kuwait-salgado.html>

-FINAL PAPER

Week 13: (April 26th): Streams and Floods:

1. Watersheds and the riparian ecosystems
2. Floods, causes, and flood control mechanisms

Cases:

- Yangtze River Flood
- Mississippi River (historical floods)
- Jökulhlaup, Iceland (1996)

Materials:

- Chapter 7: "Streams" in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (posted on Blackboard)
- ESA (2017). "Vatnajökull flooding - Iceland, 1996." Available at <https://earth.esa.int/web/earth-watching/natural-disasters/volcanoes/content/-/article/vatnajokull-flooding-iceland-1996>
- History.com (2017). "Yangtze River peaks in China." Retrieved Jan. 22, 2017 from <http://www.history.com/this-day-in-history/yangtze-river-peaks-in-china>
- Livescience (2011). "Mightiest Floods of the Mississippi River." Retrieved Jan. 22, 2017 from <http://www.livescience.com/30395-mississippi-river-biggest-floods-110503.html>

Further materials:

-Björnsson, Helgi (2002). "Subglacial lakes and jökulhlaups in Iceland." *Global and Planetary Change* 35 (2002) 255–271. Retrieved Jan. 22, 2017 from <http://www.norvol.hi.is/pdf/HB2003GlobPlanCh.pdf>

Week 14: (May 3rd): Coastal Areas and Hazards:

1. Coastal geomorphology, ocean processes, and human interference
2. Coastal recovery methods
3. Mangrove wetlands

Case:

-Sundarbans and Rampal Power Plant

Required materials:

- Chapters 14 and 15: "Problems of Mangrove Wetlands and Coral Reefs" and "Coastal Problems" in *Geohazards: Natural and Human* by Nicholas K. Coch (1995) (both posted on Blackboard)
- Harvey, Chelsea (2016). "A new power plant could devastate the world's largest mangrove forest." *The Washington Post* (July 18th). Available at <https://www.washingtonpost.com/news/energy-environment/wp/2016/07/18/a-new-power-plant-could-devastate-the-worlds-largest-mangrove-forest/>
- UNESCO, World Heritage Centre (2016). "The Sundarbans." Available at <http://whc.unesco.org/en/list/798>

Further materials:

- Wetlands International and Nature Conservancy (2014). "Mangroves for Coastal Defense." Retrieved January 15, 2017 from <http://www.nature.org/media/oceansandcoasts/mangroves-for-coastal-defence.pdf>

Week 15: (April 10th):

-FINAL PRESENTATIONS

-PAPER ABSTRACT

-Review for the Final Exam

Week 16: (May 17th): FINAL EXAM