GLY 4881 Coastal Hazards

Florida International University

Department of Earth and Environment

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Reference Texts (Available in Green Library reserve or Drop Box):

- Coastal Hazards, 1994, Journal of Coastal Research Special Issue (selected chapters)
- Coastal Hazards, 2013, Springer (selected chapters)

Discussion Papers (Provided via Drop Box or available on line):


Literature Review: You will be asked to locate relevant articles for some classes, which you will summarize in bullet points and discuss in class.
Course Justification:

Coastal hazards play a major role in today’s society because 80% of the world’s population resides near the coast. Seventeen of the twenty largest cities are located on the coast, and 90% of the world’s trade is accomplished by water transport from port cities. Large population areas, such as those located in Shanghai, China, southern Bangladesh, Venice, Italy, southwest Netherlands, and New Orleans, Louisiana, are built on low-lying river deltas. These coastal low lands are subject to hurricanes/cyclones/typhoons and sea-level rise, which make them particularly hazardous for human occupation.

Coastal hazards can cause tremendous damage and/or inflict great losses of life, yet the coastal zone is the preferred place for development. The severity of coastal disasters has been increasing in recent decades, largely because of the ever-increasing world population, but also because of global climate change, resulting in rising sea levels, which, in turn, causes increased flooding, coastal erosion, and diminished fresh water.

Intensive development of the coastal zone not only places more people and property at risk to coastal hazards, it also degrades the natural environment, interfering with nature’s ability to protect the human environment from severe events. For example, seawalls built to protect infrastructure and buildings can accelerate beach erosion and inhibit the beach’s ability to absorb storm energy, thus exposing buildings to the full force of waves and surge. Coastal development can also destroy wetlands that serve as important buffers against storm surges and other floods. While nothing can be done to prevent coastal hazard events, their adverse impacts can be reduced through proper planning, which involves complex inter-relationships among nations, government agencies at various levels, corporations and individuals.

Understanding coastal hazards and various strategies for mitigation of their impacts on society and the environment requires an understanding of their inter-disciplinary dimensions. The nature of coastal hazards spans the technical aspects to the political and economic challenges. This course examines the major coastal hazards on a worldwide basis and assesses regional susceptibilities and mitigation. Some areas are particularly prone to large tsunamis as witnessed by the Great Japanese Tsunami in 2011 that totally devastated a localized area and the 2004 Indian Ocean Tsunami that killed hundreds of thousands of people over a wide area with Indonesia, Thailand, Sri Lanka, and India being hardest hit.

Global Learning Course Outcomes:

Global Awareness—Students will be able to demonstrate an understanding of the interconnection of coastal hazards on a global basis, that these problems have no national
borders, and that these problems are affected by geological, meteorological and oceanographic factors as well as socioeconomic, technological and cultural conditions.

Global Perspective—Students will be able to conduct analyses of the impact and mitigation of coastal hazards in a global context and the extent to which multiple factors, such as economics, technology and social norms, contribute to or help solve the problem.

Global Engagement—Students will collaborate in groups to devise solutions to problems of mitigating coastal hazards, which are appropriate within the framework of economic, technological and societal factors at regional, national and global levels.

Active Learning Strategies:

Students will participate in a number of activities including:

- Class Discussions
- Discussion Groups
- Socratic Circles
- Class Debates
- Class Group Power Point presentations
- Field Trip (highly recommended)
- Video Production (extra credit)

Co-Curricular Activities:

Students will be able to participate in various on and off-campus co-curricular activities, which are available at goglobal.fiu.edu. Documented attendance of at least three of these activities and submission of a three-page summary of the activities (one page per activity) will count as extra credit in the course.

Grading Policy:

Grades will be based on the following scores:

- Class discussions, presentations and debates 20%
- Weekly write-ups of assigned readings and 20%
literature review (use bullet points for main points and critical questions; limit one page per assignment with second page for any references)

- Mid-term exam 20%
- Final exam 20%
- Team peer assessment 10%
- Attendance 10%
- Video project and/or co-curricular activities 5% (extra credit)

Grading Scale:

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<th>Grade</th>
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Class Schedule

Date (2013) | Topic | Reading
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August 26 | Ground Rules and Introduction to Course | Syllabus

Causes of Global Coastal Hazards

Engaging Question: Are coastal disasters inevitable?

Class discussion of causes of coastal hazards, including geological, meteorological, oceanographic, and human-induced factors. (Global Awareness)

Learning Activity: Power Point Presentation

Assignment: One page summary each of literature review
of Hurricane Katrina flooding of New Orleans and past storm surges in Bangladesh.

September 2  No class

September 9  Hurricanes, Cyclones and Typhoons: Most Powerful Storms on Earth by Different Names
Engaging Question: What steps can be taken to reduce the impacts of storm surges in Bangladesh and New Orleans considering their different socio-economic conditions? (Global Perspective)
Class discussion of storm surges and flooding in the Bay of Bengal, Bangladesh and New Orleans (Socratic Circles)
Learning Activity: Power Point Presentation
Assignment: One page write-up of Preface and Summary of Heinz Report Evaluation of Coastal Erosion Hazards

September 16  Coastal Erosion Hazards  Heinz Report
Engaging Question: How significant is the coastal erosion hazard?
Class discussion of the nature of the erosion problem and policy options.
Learning Activity: Power Point Presentation
Assignment: Literature review and summary of Super Storm Sandy’s impact on beachfront development in
northern New Jersey

September 23  Hurricane Impacts on Beachfront Properties  Literature Review

Engaging Question: Should beachfront property owners in northern New Jersey be allowed to rebuild their houses on what is now the oceanic beach? (Global Awareness, Perspective and Engagement)

Group discussion and debate of stakeholders, taking the position of FEMA (disaster and flood insurance programs), state officials, town mayors, homeowners, and NGOs (e.g., environmental groups such as NRDC and EDF). Who would stand to benefit or lose?

Learning Activity: Power Point Presentation

Socratic Circle discussion: What kind of impact would Super Storm Sandy have if it struck Miami, considering that it was only a category one hurricane? How resilient is Miami vs. New Jersey, considering the differences between hazard, vulnerability and disaster.

Assignment: Summary of Wall of Wind article.

September 30  Hurricane Wind Impacts and Resilient Construction  WoW Article

Engaging Question: How can hurricane damage be mitigated?

Class Group Debate of challenges in mitigating
hurricane damage considering that the City of Miami Beach is located on a barrier island. (Global Engagement)

Learning Activity: Power Point Presentation

Assignment: One-page summary of Academic Press chapter.

October 7  Global Sea Level Rise and Responses          Academic Press chapter
Engaging Question: Is it inevitable that there will be wholesale land losses in response to global warming-induced sea level rise?
Class discussion of disaster risk management in an age of climate change (Global Awareness)
Learning Activity: Power Point Presentation
Assignment: One page summary each of reasons and consequences of the “sinking” of island nations, such as Tuvalu based on literature review, and Island States at Risk JCR Special Issue.

October 14  Sea Level Rise Impacts: Coastal Flooding and Inundation          Lit. Review & JCR
Engaging Question: How might small island nations, such as Tuvalu, respond to sea level rise compared to western countries?
Class Discussion: What steps can be taken to reduce the impacts on small island nations; consider the formation of the Alliance of Small Island States (AOSIS)? (Global Engagement)
Learning Activity: Power Point presentation
Assignment: Preparation for Mid-Term Exam

October 21

Mid-Term Exam

Assignment: Summary of Rip Currents Springer Chapter 26

October 28

Rip Currents: A Major Global Coastal Hazard

Engaging Question: What can be done to improve public understanding of the risk of rip currents, considering that there are five different types, which exhibit a range of characteristics and require different strategies for escape? (Global Perspective)

Learning Activity: Power Point Presentation

Class discussion of rip currents as an often-neglected coastal hazard and the fact that only one type of warning sign is presently used on US coasts and indeed worldwide.

Assignment: One page summary each of literature review of Indian Ocean tsunami and past Caribbean tsunamis.

November 2

Saturday, day-long field trip to Miami Beach to study rip currents and tidal currents at Haulover Inlet.

Students will bring their cell phones or cameras to video currents as delineated by fluorescent dye plumes and can make a short video (e.g., 30 second to 1 minute), which will illustrate
the danger of these powerful currents to promote public awareness. (Global Engagement)

Students are strongly encouraged to participate in the field trip; extra credit will be awarded for production of a short video.

November 4  Tsunamis in a Global Context  Literature Review

Class discussion of tsunamis and implications for the Caribbean and South Florida. (Global Awareness)

Learning Activity: Power Point Presentation


November 11  Tsunamis and Coastal Disasters  Literature Review

Engaging Question: What can be done to reduce the susceptibility of the world’s coastal populations to tsunamis?

The tsunami disaster of 2004 that resulted in more than 200,000 people being killed in several countries and the Great Japanese Tsunami of 2011 raised worldwide awareness of the destructiveness of these powerful waves.

Learning Activity: Power Point Presentation

Class debate: Instead of each country fending for itself, how can global citizens help to address this huge problem in terms of better anticipation of such occurrences through technology and reducing the misery in the aftermath of such events? (Global
November 18  Students will showcase their beach safety videos in class, which will engender considerable class discussion. The best videos will be placed on the web (www.ripcurrents.com) and YouTube.

Learning Activity:  Review of video “Beach Rips: Killer Currents”

Assignment: One-page summary each of literature review of 1979 Ixtoc and BP Deepwater Horizon oil spills in the Gulf of Mexico impacts on wildlife, especially birds and dolphins, and beach pollution and coastal tourism. Students will work in small groups to make powerpoints about causes of various oil spills and their consequences.

November 25  Oil Spills and Coastal Disasters  Literature Review

Engaging Question: What can be done to prevent future disasters such as the BP oil spill in the Gulf of Mexico?

Class discussion: News reporters stated that the BP spill was the worst ecological disaster in North America, but consider the Exxon Valdez shipwreck in 1989 and the Ixtoc oil spill in 1979.

Learning Activity: Students in groups will make power point presentations on past major oil spills from the viewpoint of socioeconomic and environment implications and/or mitigation.

(Global Awareness, Perspective and Engagement)
Assignment: Summary of literature review on past flooding events in New Orleans and the problem of depending on levees for protection of a city below sea level.

December 2 Human-Induced Coastal Disasters Literature Review

Engaging Question: Are human-induced coastal disasters inevitable?

Class debate/role-playing exercise wherein students will devise solutions to human-induced coastal hazards, such as oil spill disasters, improperly-built levees in New Orleans that failed by being undermined by Hurricane Katrina’s storm surge, and permitting beachfront development at the water’s edge in hurricane-prone areas.

Each group will represent a distinct viewpoint on the problem.

Learning Activity: Power Point Presentation

Assignment: Preparation for Final Exam.

December 9 Final Exam