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GLY 4881 Coastal Hazards

Florida International University
Department of Earth and Environment

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Classroom: DM-163

Reference Texts (Available at Green Library Reserve):

- *Coastal Hazards*, 2013, Springer
- *Island States at Risk: Global Climate Change, Population and Development*, 1997, Journal of Coastal Research Special Issue
- *The Human Shore*, 2012, University of Chicago

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

- Rip Currents, 2013, Springer Chapter 26, p. 811-831.
- Rip Current Hazard in Costa Rica, 2015, Natural Hazards.
- Wall of Wind Full-Scale Destructive Testing of Coastal Houses and Hurricane Damage Mitigation, 2007, Journal of Coastal Research (JCR), V.23, p.1211-1217.
- Social and Economic Costs of Sea Level Rise, 2001, Academic Press, Chapter 8, p. 181-223.
- Evaluation of Erosion Hazards, 2000, Heinz Center, Washington, DC
www.fema.gov/pdf/library/erosion.pdf

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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.

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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
- Rip Current Video Project
- Field Trip
- Co-Curricular Activities (extra credit)

Co-Curricular Activities:

Students will be able to participate in various on and off-campus co-curricular activities, which are available at gglobal.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:

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- Class discussions and debates 20%
- Weekly write-ups of assigned readings and literature reviews (use bullet format for main points) and three thought-provoking questions and/or **pro-active approaches** to lower the loss of life and/or damage (e.g., hazard mitigation) per assignment 20%
- Mid-term exam 20%
- Final exam 20%
- Rip Current Video Project (do not endanger yourself by getting into an actual rip current—**FIU assumes no liability for your safety in the water**) 10%
- Attendance & Pop Quizzes 10%

Grading Scale:

A 93-100	B 83-86	C 70-76	D 60-69	F <60
A- 90-92	B- 80-82			
	B+ 87-89	C+ 77-79		

Early Alert:

In an effort to help you succeed in your academic courses, FIU utilizes an Early Alert system. Instructors are now able to notify students' academic advisors if there are concerns about class performance. If an alert is submitted, your academic advisor will send you a message via your Student Dashboard (accessed via your MYFIU page) to discuss ways to improve your performance. Please respond to any communication you receive from your academic advisor about an early alert. Our goal with this program is to help you to be successful by identifying any issues as early on as possible and working to address them.

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Class Schedule

<u>Date</u>	<u>Topic</u>	<u>Reading</u>
Week 1	Ground Rules and Introduction to Course 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 for next week: Two-page summary of Rip Currents in Chapter 26 of Springer book (see DropBox).	Syllabus
Week 2	Rip Currents: A Major Global Coastal Hazard Engaging Question: What are rip currents and why are so many people killed by this little recognized hazard with the United States, Australia, Brazil and Israel being hot spots? Learning Activity: Power Point Presentation Assignment for next week: One page summary of article on the Rip Current Hazard in Costa Rica (see DropBox).	
Week 3	No class—Labor Day	

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Week 4 Rip Current Case Study: Costa Rica

Rip currents are the leading cause of accidental death in Costa Rica, only exceeded by traffic accidents. The Pacific coast of Costa Rica is particularly dangerous because of the large, long-period swell waves that arrive from offshore storms. Four American tourists on an educational trip were drowned at Palo Seco Beach in one afternoon, which served to alert officials of this hazard. Recent studies have demonstrated that rip currents are commonly present on many of the popular beaches with Jaco Beach having the most deaths in spite of life guards.

Engaging Question: What actions can be taken to alert the Costa Ricans, most of whom cannot swim, as well as international tourists who are drawn to these beautiful, tropical beaches?

Learning Activity: Powerpoint Presentation

Assignment for next week: Draft outline of your proposed rip current video that may be posted on www.ripcurrents.com and YouTube.

September 17 Saturday field trip to a South Florida beach

Week 5 Rip Currents: Most Dangerous Hazard at Beaches Internationally

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 Awareness and Engagement)

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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 for next week: One page summary of literature review of Bangladeshi cyclones in terms of impacts and possible mitigation.

Week 6

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 Miami considering their different socio-economic conditions? (Global Perspective)

Class discussion of storm surges and flooding in the Bay of Bengal, Bangladesh and Miami (Socratic Circles)

Learning Activity: Power Point Presentation

Assignment for next week: One-page summary of Wall of Wind article (see DropBox).

Week 7

Hurricane Wind Impacts and Resilient Construction

Engaging Question: How can hurricane damage be mitigated?

Class Group Debate of challenges in mitigating hurricane damage considering that the City of Miami

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Beach is located on a barrier island. How well are buildings in “developing countries” constructed?—consider the New Year’s Eve fire in a Dubai high-rise hotel. (Global Engagement)

Learning Activity: Power Point Presentation

Assignment for next week: One page summary of literature review of Super Storm Sandy’s impact on beachfront development in northern New Jersey. Write four short-answer questions (with answers) for possible use in the Mid-Term Exam.

Week 8

Hurricane Impacts on Beachfront Properties

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 had if it struck Miami or the world-famous Atlantis Hotel in Nassau, Bahamas? How resilient is Miami vs. New Jersey, considering the differences among the terms hazard,

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vulnerability and disaster.

Assignment for next week: Preparation for Mid-Term Exam

Week 9 Mid-Term Exam

Assignment for next week: Two page summary of literature review of Indian Ocean Tsunami of 2004 and Great Japanese Tsunami of 2011.

Week 10 Tsunamis in a Global Context

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

The tsunami disaster of 2004 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 Engagement)

Assignment for next week: One-page summary of Social and Economic Costs of Sea Level Rise article (see DropBox).

Week 11 Global Sea Level Rise and Responses

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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 for next week: One page summary of “Vanishing Lands” video (available in DropBox or YouTube) and review for class discussion (no write-up) articles regarding Tuvalu and Maldives—two small island nations.

Week 12

Sea Level Rise Impacts: Coastal Flooding and Inundation

Engaging Question: How might small island nations, such as Tuvalu, respond to sea level rise compared to developed 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 for next week: One page summary of Chapter 1 in Heinz Report Evaluation of Coastal Erosion Hazards (see link under Discussion Papers).

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Week 13 Coastal Erosion Hazards

Engaging Question: How significant is the coastal erosion hazard?

Class discussion of the nature of the erosion problem and policy options for beachfront communities.

Learning Activity: Power Point Presentation

Assignment for next week: Two page summary of literature review of Exxon-Valdez spill in Alaska and BP oil spill in the Gulf of Mexico regarding impacts on wildlife.

Week 14 Oil Spills and Coastal Disasters

Engaging Question: What can be done to prevent future disasters such as the BP Deepwater Horizon 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 Alaska and the Ixtoc oil spill in Mexico.

Learning Activity: Students in small groups will make powerpoint presentations on past major oil spills from a range of viewpoints.

Assignment for next week: Two page summary of literature review on problem of depending on levees to protect New Orleans from past hurricanes and the flooding problems in Venice, Italy and MOSE project.

Week 15 Human-Induced Coastal Disasters

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,

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improperly-built levees in New Orleans that failed by being undermined by Hurricane Katrina's storm surge, permitting beachfront development in highly erosional areas such as Rodanthe, NC, and the problem of protecting the historical city of Venice, Italy from storm flooding.

Each group will represent a distinct viewpoint on the problem.

Learning Activity: Power Point Presentation

Assignment for next week: Prepare for Final Exam.

Week 16 **Final Exam**

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