

## SEMESTER AT SEA COURSE SYLLABUS

Voyage: Spring 2014

Discipline: Environmental Science

EVSC 2559: Human Impacts on Coastal Environments

Division: Lower

Faculty Name: Gary Griggs

**Pre-requisites:** None

### ***COURSE DESCRIPTION***

The coastal zone is where about 50% of the planet's people have chosen to live and this percentage continues to increase. These billions of people have profound impacts on this diverse and often fragile environment and the processes and hazards that characterize the coastal zone can significantly affect humans, their development and way of life. Topics to be included:

- 1] *The evolution and diversity of global coastlines:* Active and passive margins, Arctic, temperate and tropical.
- 2] *Coastal processes and hazards:* a. hurricanes, cyclones & typhoons; b. El Niños and flooding; c. subduction zone earthquakes and tsunamis; d. coastal erosion & shoreline retreat;
- 3] *Climate Change and Impacts:* sea level rise and inundation, changing storm climate and ocean acidification;
- 4] *Runoff and Waste Discharge:* sources and impacts of water pollution including thermal discharges/pollution; sewage; nutrients and fertilizers; hypoxia and dead zones; pesticides and other chemical wastes including plastic in the sea;
- 5] *Impacts of the Extraction of Petroleum and Ground Water:* oil in the sea, subsidence and seawater intrusion;
- 6] *Biological Impacts:* invasive species; overfishing and marine protected areas; coral reef degradation and destruction; harmful algal blooms and dead zones; aquaculture; desalination; invasive species & aquaculture.

### ***COURSE OBJECTIVES***

To develop a clear understanding of impacts and the significance that human development and activities have had and are increasingly having on the Earth's coastal zones; and also the ways in which the coastal processes and hazards impact human settlement. To understand how different coastal regions across the globe have been affected by the type and intensity of human development as well as their concern or lack of concern for their impacts and their awareness of hazards they are exposed to.

### ***READING LIST-*** all available electronically

1. Creel, E. 2102. Ripple Effects; Population and Coastal Regions. Population Reference Bureau.
2. Hinrichsen, D. 2012. Ocean Planet in Decline, [peopleandplanet.net](http://peopleandplanet.net)
3. Hinrichsen, D. 1995. Coasts in Crisis; Coasts and the Population Bomb. American Association for the Advancement of Science
4. Center for Ocean Solutions, Ecosystems and People of the Pacific Ocean-Threats and Opportunities for Action: A Scientific Consensus Statement.

5. U.S. Geological Survey, 1997. Coasts in Crisis.
6. Koch, N. 2008. Geotimes, The Impending Coastal Crisis.
7. Trujillo and Thurman, 2011. Essentials of Oceanography, Prentice-Hall Chapter 16. The Oceans and Climate Change, p.468-495.
8. Nicholls, R.J. 2011. Planning for Sea-Level Rise, Oceanography.
9. Russell, N. and Griggs, G.B. 2012. Adapting to Sea-Level Rise: A Guide for California's Coastal Communities: 49p.
10. Hyndman, D. and Hyndman, D. 2011. Natural Hazards and Disasters. Chapter 5. Tsunami, p. 105-131.
11. Sverdrup, K.A. and Kudela, R.M., 2013. Investigating Oceanography. Chapter 15. Environmental Issues.
12. Oceana, 2008. Acid Test: Can we save our oceans from CO<sub>2</sub>
13. World Wildlife Fund, Coral Reefs. 2012.
14. Anderson, D.M. 2005. The Ecology and Oceanography of Harmful Algal Blooms
15. NASA. Creeping Dead Zones. Goddard Earth Sciences Data and Information Services Center.
16. Oregon Sea Grant, 2012. Hypoxia: How it is affecting ocean life, and why?
17. Natural Resources Defense Council, 1995. Marine Fisheries, Population and Consumption: Science and Policy Issues.
18. Marine Protected Areas, Wikipedia.
19. NOAA, 2012. Aquatic Invasive Species
20. NOAA, 2012. Aquatic Nuisance Species

### ***CLASS TOPICAL OUTLINE BY WEEK***

<b>DATE</b>	<b>TOPIC</b>	<b>READING (Ref. #)</b>
Jan 12	Introduction to Course and Syllabus: Organization and Scope	

Jan 14	Human Settlement, Occupation and impacts on Coastal areas	1, 2, 3, 4
Jan 16	Coasts: Origins, tectonic and global diversity and distribution of landforms	5
<b>Jan 17</b>	<b><i>Hilo, Hawaii-</i></b>	
Jan 19	Coastal processes: terrestrial and marine: waves, tides, organic coastlines (reefs/mangroves), climate and weathering	4
Jan 22	Coastal hazards: subduction zone earthquakes and tsunamis; global distribution and impacts	10
Jan 25	Coastal hazards: Coastal erosion and responses	5, 6, 13
Jan 27	Coastal hazards: hurricanes, cyclones and typhoons	10
<b>Jan 29-Feb 3</b>	<b><i>Yokohama and Kobe, Japan</i></b>	
Feb 4	Climate change and coastal impacts: PDO and ENSO	5, 7
<b>Feb 6-11</b>	<b><i>Shanghai and Hong Kong- Class Field Trip February 11</i></b>	
Feb 12	Sea level rise impacts: erosion, flooding and inundation	7, 8, 9
<b>Feb 14-19</b>	<b><i>Ho Chi Minh, Viet Nam</i></b>	
Feb 20	Adapting/responding to sea-level rise	
<b>Feb 22-23</b>	<b><i>Singapore</i></b>	
Feb 24	Climate change: biological impacts of ocean warming and ocean Acidification	12
<b>Feb 27-Mar 4</b>	<b><i>Rangoon, Myanmar</i></b>	
Mar 5	Marine Pollution; Plastics and marine debris	11
Mar 7	Waste water discharge: domestic and industrial wastes: Organics, nutrients, bacteria and virus; effects and treatment	2, 11
<b>Mar 9-14</b>	<b><i>Cochin, India</i></b>	
Mar 15	Coral reefs: factors controlling distribution and human impacts on reefs	12, 13
Mar 18	Fishing, overfishing, & aquaculture	11,17, 18

Mar 20	Invasive and exotic species	19, 20
<b>Mar 21</b>	<b><i>Port Louis, Mauritius</i></b>	
Mar 26	Industrial/chemical wastes and impacts: heavy metals, persistent organic compounds and pesticides	2, 11, 21
<b>Mar 28- Apr 2</b>	<b><i>Cape Town, South Africa</i></b>	
Apr 3	Coastal power plants: Thermal discharges & impacts; Nuclear power & radioactive wastes	5
Apr 5	Desalination	
Apr 8	Harmful algal blooms, hypoxia and dead zones	11, 14, 15, 16
<b>Apr 10-14</b>	<b><i>Takoradi &amp; Accra, Ghana</i></b>	
Apr 15	Oil and gas: formation, extraction, & transportation	2, 11
Apr 17	Oil spills and their impacts; Fluid withdrawal (oil and water), subsidence and sea water intrusion	2, 11
Apr 20	Ocean renewable energy development: potential, progress, and problems	5, 17
<b>Apr 23-27</b>	<b><i>Casablanca, Morocco</i></b>	
<b>April 28</b>	<b>Final Exam</b>	

## **FIELD WORK**

Hong Kong has an intensively developed coastline where extensive filling has been used to extend the shoreline seaward in order to obtain more developable land, but also has the Mai Po Nature Reserve that will be a striking contrast to the urbanized coast. This reserve managed by the World Wide Fund, for Nature, is rich in biodiversity and is a haven for thousands of migratory birds (over 350 different species) during autumn and winter, as well as mammals and reptiles. This reserve is part of Deep Bay, which faces threats from pollution, intense urbanization and excess sedimentation. The reserve can be observed through floating boardwalks and elevated trails that traverse mudflats and mangroves, as well as a dozen “hides” (towers or huts where you can watch birds up close without being seen-binoculars would be useful). Close by and within view is the skyline of the city of Shenzhen.

We will arrive at Mai Po around 9am (so leaving central Hong Kong at about 8am) and plan to spend at least 4-5 hours there, potentially a little bit more. One of the highlights of a trip to Mai Po, especially in the winter, is a walk out to the floating bird hides on the edge of Deep Water Bay. It takes about an hour to walk out to the hides, longer if we stop to look at things along the way, so it really is an almost full day trip to visit the reserve.





### ***FIELD ASSIGNMENTS***

- Student will submit an illustrated paper (photo essay) illustrating the differences in degree of shoreline/coastal development in Hong Kong comparing the developed portion of the city and the Mai Po Nature Reserve. This will include an analysis or explanation of what they have observed, how the type and intensity of development has affected the particular coastline (e.g. environmental impacts) and how the landforms of geographic setting of this particular coastal area has allowed or hindered development. Google Earth can provide considerable pre-port information on the site selected and the coastal development and land use, and can also be used effectively in the paper submitted. Historical imagery is also available on Google Earth that can be utilized to examine the changes that have taken place in recent years. Grading will be based on the student's observations and discussion and how much they are able to derive from the day's experience.

### ***METHODS OF EVALUATION / GRADING RUBRIC***

Student grade will be based on 3 quizzes (35%), a paper based on the field assignment (20%), class participation (attendance, engagement in class discussion -15%) and a final exam (30%).

### ***RESERVE LIBRARY LIST (more to come)***

1. *Coastal Crisis-Louisiana's Coast:*

<http://coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=112>

2. The Impending Coastal Crisis: *Geotimes*, March 2008
3. *Coasts in Crisis*: United States Geological Survey Circular 97-1075
4. *Coasts in Crisis: Science and Technology*, summer 1996
5. *NOAA Ocean and Coastal Resource Management* (<http://coastalmanagement.noaa.gov/>)
6. *Coastal Challenges: A Guide to Coastal and Marine Issues*. Environmental Health Center (1998)

## **HONOR CODE**

Semester at Sea students enroll in an academic program administered by the University of Virginia, and thus bind themselves to the University's honor code. The code prohibits all acts of lying, cheating, and stealing. Please consult the Voyager's Handbook for further explanation of what constitutes an honor offense.

Each written assignment for this course must be pledged by the student as follows: "On my honor as a student, I pledge that I have neither given nor received aid on this assignment." The pledge must be signed, or, in the case of an electronic file, signed "[signed]."