DISASTER SCIENCE:

UNDERSTANDING HAZARDS AND DISASTERS

COURSE SYLLABUS

SPRING 2016

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POST 703

MONDAYS, 5 – 8 PM

COURSE DESCRIPTION

Disaster Science will be taught in a seminar format consisting of learning environments in both the field and the classroom. A weekend field excursion to the Big Island of Hawai'i is voluntary, and will provide first-hand familiarity with several of the hazards to be discussed in the class. Classes will include a combination of lectures by the instructors, guests, and case studies presented by the students. Lectures are split into two sections: one addresses the physical science of the natural event (and how it happens) while the other concentrates on the social impacts and human responses to natural hazard events using case studies. Seminars provide the foundation for which students will prepare their assignments and presentations. The course has key readings that should be reviewed by the student, as well as many optional ones that provide a more complete understanding of disasters presented in the case studies.

COURSE DESCRIPTION

INTRODUCTION: We will discuss how to define a disaster, as well as the frequency and intensity of disasters. This lecture will set up the course framework and make some brief comparisons between many types of disasters of recent years. We will discuss how to understand 1) physical processes of hazards, 2) scales of hazard impact (dependent on hazard intensity and types of communities affected), and 3) societal reactions to the events (social, political, and economical). Four types of events will be singled out for case studies of disasters.

- What is a disaster (1 hour)
- Risk and resilience (1 hour)

VOLCANIC CRISIS MODULE: Volcanic eruptions are unique among hazards faced by societies due to 1) the long-lived nature of an event, 2) multiple hazards can be spawned by one event, 3) haz3) hazards can have widespread impact, and 4) warning signs are typically present for days to months. (sometimes causing fatigue and indifference). This module is structured arund participation in the FEMA-sponsored Volcano Crisis Awareness course AWR-233. S

It will also be closely focused on the current lava flow crisis in Puna linked to the ongoing Kīlauea eruption.

- AWR-233 Volcanic crises awareness (5 hours)
- AWR scenario (3 hours)
- Big Island excursion (16 hours)

EXTREME WEATHER MODULE: Hurricanes are regional events that last for hours to days, and provide days to a week of warning time. There is typically time to prepare for a hurricane or evacuate from a predicted area to be adversely affected, provided that communities have the means to do so. In the first section of this module, we will discuss how hurricanes are classified, why/how/where they form, factors contributing to their intensity, and the hazards posed by

them. In the second section of this module, we will consider the social, political, and infrastructural impacts of Hurricane Katrina (2005, USA), and in less detail, Hurricane Sandy (2012, USA) and compare these events to other smaller intense weather systems.

- Fundamentals of extreme weather (1 hours)
- Katrina case study (1 hour)
- Sandy case study (1 hour)
- Tornado and storm case studies (1 hours)

EARTHQUAKES MODULE: Earthquakes are short-lived, regional events with little to no warning time. Earthquakes rarely kill people is, rather, it is infrastructural damage caused by the earthquake that kills people. We will discuss how earthquakes are classified, where they typically occur, and how scientists measure them), factors leading to the intensity of shaking felt by communities, and why this ground motion causes damage to infrastructure. We will consider economic and human costs of earthquakes, social and political responses, and how preparation/community resilience can dramatically alter the recovery time for an earthquake. The focus will be on a case study of Kobe (1991, is on Kobe, Japan with comparison to 21st century earthquakes.

- Physical nature and impacts of earthquakes (1 hours)
- Social nature of earthquake disasters (1 hour)
- Kobe 1995 case study
- L'Aquila trial (1 hour)

TSUNAMI MODULE: Large tsunamis are of international extent, accompanied by great earthquakes, and provide up to several hours of warning time. In the first section of this module, we will discuss what a tsunami is, how ocean-wide damaging tsunamis are generated, how we measure them both on land and in the ocean basin, what damage they can cause, why the same tsunami may behave differently at different coastlines, and classic warning signs that a tsunami is imminent. In the second section of this module, we will analyze and reflect on the first-ever recorded Indian Ocean tsunami (2004, Indonesia) and its international social, political, and economic impacts. We will also discuss the recent Tohoku tsunami (2011, Japan).

- Physical nature of tsunamis (1 hour)
- *I*mpacts of tsunamis (1 hour)
- Indian ocean case study (1 hour)
- Tohoku case study (1 hour)

STUDENT PRESENTATIONS: Order of presentations is TBA. Students will pick their own disaster and give a 20 minute presentation to the class on what the hazard was, and why the result was a disaster. Any event (world wide) is eligible, but duplicates in the class are not allowed. Sign up for your event as soon as you are decided on it.

COURSE EVALUATION

ACTIVITY	WEIGHT	GRADE
Big Island Assignment	240%	>90% = A
Tohoku Paper	20%	>80% = B
Mini Case Study	40%	>70% = C

There will be no extra credit and no curving of final marks.

KEY REFERENCES

General reading

- Keller, E.A., DeVecchio, D. E., 2011. *Natural Hazards: Earth's processes as hazards, disasters, and catastrophes* (3rd Edition) Prentice Hall. ISBN 0-13-030957-5. 448 pp.
- Mileti, D.S., 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Joseph Henry Press. Washington D.C. 351pp.

- Introductory class
  - Centre for Research on the Epidemiology of Disasters (2015). The human cost of natural disasters: a global perspective. 57 pp.
  - Pelling, M., 2005. Natural disasters? In *Social Nature: Theory, practice and politics*. Castree, N., Braun, B., (eds). Blackwell, pp. 170-188.

- Volcano Module
  - Heliker, C., Stauffer, P.H. and Hendley, J.W. 1997. Living on Active Volcanoes—The Island of Hawai'i. *U.S. Geological Survey Fact Sheet* 073-97, 4 p
  - Kauahikaua. J, 2007, Lava Flow Hazard Assessment, as of August 2007, for Kīlauea East Rift Zone Eruptions, Hawai'i Island, *U.S. Geological Survey Open-File Report* 2007-1264, 12 p.
  - Mullineaux, Donal Ray; Peterson, Donald W., 1974, Volcanic hazards on the Island of Hawaii, *U.S. Geological Survey Open-File Report 73*-239, 61p.
  - Sutton, J., Elias, T., Hendley J.W., and Stauffer, P.H. 2000. Volcanic Air Pollution—A Hazard in Hawai`i. *U.S. Geological Survey Fact Sheet* 169-97, 4

- Extreme Weather Module
  - Katrina
    - ✓ Abramson, D.M., Stehling-Ariza, T., Park, Y.S., Walsh, L., Culp, D., 2010. Measuring Individual Disaster Recovery: A Socioecological Framework. In: *Disaster Medicine and Public Health Preparedness* 4(1): S46-S54.
    - ✓ Eisenman, D.P., Cordasco, K.M., Asch, S., Golden, J.F., Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: Lessons from Hurricane Katrina. American Journal of Public Health, 97: 109-115.
    - ✓ Robertson, D.O., 2008. Property and Security, Political Chameleons, and Dysfunctional Regime: A New Orleans Story. In: *Seeking Higher Ground: The Hurricane Katrina Crisis, Race, and Public Policy Reader,* (eds) Marable, M., Clarke, K., New York: Palgrave Macmillan. pp. 39-63

- Earthquake Module
  - Kobe, Japan
    - ✓ Tierney, Goltz, 1997. Emergency Response: Lessons Learned from the Kobe Earthquake, University of Delaware Disaster Research Center.
    - ✓ Somerville, P., 1995, Kobe Earthquake: an urban disaster. EOS, American geophysical union, 76, 49-51 (cross ref: Current Science, vol 68, iss 12, 1205-1208)
    - ✓ Katayama, T., 2004. Earthquake disaster risk mitigation before and after the 1995 Kobe earthquake. 13th world conference on earthquake engineering, #5005

- Tsunami Module
  - Tohoku, Pacific Ocean
    - ✓ Imamura, Anawat, 2012. Damage due to the 2011 Tohoku earthquake tsunami and its lessons for future mitigation. Proceedings of the international symposium on engineering lessons learned from the 2011 great east Japan earthquake, March 1-4, 2012, Tokyo, Japan.
    - ✓ Normile, D., 2012. One year after the devastation, Tohoku designs its renewal. Science, 335, pp. 1164-1166
    - ✓ Bird, W.A., Grossman, E., 2011. Chemical Aftermath: Contamination and Cleanup Following the Tohoku Earthquake and Tsunami Environ Health Perspect. July; 119, 7, pp. a290–a301. doi: 10.1289/ehp.119-a290
  - Indonesian, Indian Ocean
    - ✓ Athukorala, Resosudarmo, 2005. The Indian Ocean Tsunami: Economic Impact, Disaster management, and Lessons. Asian Economic Papers.
    - ✓ Rodriguez, Wachtendorf, Kendra, Trainor, 2006. A snapshot of the 2004 Indian Ocean tsunami: societal impacts and consequences. Disaster Prevention and Management, 15, 1, pp. 163-177.