

## Risk Analysis & Environmental Management

---

OIDD-761 / Fall 2020

Monday and Wednesday 10:30am – 11:50am EST

*This course will be taught online in fall 2020.*

**Instructor:** Dr. Carolyn Kousky

**Office hours:** Thursday 4:15 – 5:30pm (send an email to the course email address to schedule a 15-minute virtual meeting slot)

**TA:** Emily Snow

**Course Email:** [oidd761.2020@gmail.com](mailto:oidd761.2020@gmail.com)

- All questions about the course, including assignments, should be sent to the course email address.
- Requests for an office hours slot should be sent to the course email address.

### **Course Description**

This course will introduce students to concepts in risk governance. We will delve into the three pillars of risk analysis: risk assessment, risk management, and risk communication. The course will spend time on risk financing, including insurance markets. There will be particular emphasis on climate risk management, although the course will also discuss several other examples, including management of environmental risks, pandemics, and terrorism, among other examples. The course will cover how people perceive risks and the impact this has on risk communication and management. We will explore public policy surrounding risk management and how the public and private sector can successfully work together to build resilience, particularly to changing risks.

### **Notes on Virtual Learning**

Students are not allowed to download and repost or share course videos anywhere. Doing so is a violation of the [Code of Academic Integrity](#).

**Lectures:** The class will be a hybrid of asynchronous and synchronous learning. Students are expected to participate fully in both.

*Mondays we will have asynchronous lectures.* You can watch these videos anytime between when they are posted the Friday before class and the end of the day on Monday. Students may choose to watch them during the regularly scheduled class time of Monday 10:30 – 11:50 EST. Watching these videos is mandatory.

*Wednesday lectures will be synchronous.* Students are required to virtually attend Wednesday online at the scheduled class time of 10:30am EST – 11:50EST. Attendance at the lecture will be

taken; please be on time. You will use the chat function to indicate when you have a question or comment. This will be moderated by the TA and at the appropriate time you will be asked to un-mute and ask your question for the class. Please keep your video on through the entire class.

**Readings:** Each day has required readings. You are required to finish the readings before the scheduled class day on which they are listed. Material from the readings may be necessary for completing online discussion assignments or for the weekly quizzes.

### **Course Grading**

Weekly quizzes	25%
Weekly discussion postings	25%
Mid-term blog/oped	25%
At-home final	25%

### **Assignments**

**Weekly Quizzes:** Each week there will be a mandatory quiz. **Each weekly quiz needs to be taken sometime on Thursday.** Each quiz will be available on Canvas for 24 hours, from Wednesday midnight until Thursday midnight. Each quiz will be 1 - 5 questions and will draw on the lectures and readings of the week. To succeed on the quizzes, you must do the readings and attend the lectures. Quizzes are open-note but they do have a time limit—if you have to look up every answer, you will not have time to finish. You are not to share quiz questions with other students in the course after you take the quiz. Students will not have the option to take quizzes late or to make-up missed quizzes. One missed quiz should not substantially impact your total quiz grade but multiple missed quizzes or many poor performances will lower your grade.

**Weekly discussion postings:** Students will be broken into 2-3 groups for online discussions. Each week, a discussion prompt will be posted on Monday. **Students should respond to the prompt sometime before the end of the day Friday. They should also respond to at least 2 other posts of classmates.** Students will be graded on both their participation in the discussion (responding to the prompt and responding to at least 2 classmate responses) *and* will be graded on the thoughtfulness of their responses. Responses to the prompt and to classmates that demonstrate the student has read the course readings, has attended lectures, and is thinking critically about the discussion will receive higher grades. *The initial response to the prompt should be target roughly 250-300 words. The responses to peers can be between 50 and 150 words.* Discussions will close at midnight Friday and no further responses will be allowed. Students will not be allowed to make up discussion if they fail to post during the week.

**Mid-term blog/oped:** Each student will write one blog or oped on a topic relevant to the course. The blog/oped should be between 600 and 1,000 words. Please note that substantially

longer pieces will be marked down; staying in the word limit is part of the assignment. These pieces should be submitted on Canvas by the end of the day on November 16<sup>th</sup>. Assignments will receive a one-third of a letter grade deduction for each 24 hours that the assignment is late. Blogs/opeds will be graded on the following criteria:

- Staying within the word count and submitting on-time
- Choosing a topic that is clearly related to the course
- Well-written and well organized: It should be easy for a reader to follow the development of your argument and material should be presented logically.
- Citations to relevant research: Your piece should be informed by research, which can include course readings. You should footnote these sources using a proper citation method. ANY statistic or finding in the piece MUST have a citation to support it. Demonstration of research will lead to a higher grade.
- A clear argument: Your piece should have a clear argument, thesis, or unique perspective that you are presenting and that you support through your writing. A simple summary or “101” of a topic will NOT receive a high grade. Demonstration of analysis and critical thinking are required to score highly on this assignment.

**At-home final:** Students will have an open note, at-home final exam. This will be done via Canvas. It will be a 90-minute exam that can be taken at any point in a 24-hour period. Questions will be largely short-answer but will also be some other question formats. Students are to work independently on the exam and not speak to classmates about the questions or answers. The exam may cover any reading or lecture in the course.

### **Collaboration and Plagiarism Guidelines**

Students are to work individually on all assignments. Students are encouraged to discuss course themes and topics with each other, but all research, idea generation, and writing for the blog and final exam must be done individually.

All literature or other work used in assignments must be documented using a standard citation format accompanied by a reference list at the end of the paper. See guidelines online [here](#). Plagiarism is taken seriously and will be dealt with according to university policy. Students must adhere at all times to the University of Pennsylvania’s Code of Academic Integrity.

### **Course Outline and Readings**

#### **1. September 2 (W): Introduction to Risk Management**

Readings:

- [Global Risks Report 2020](#), World Economic Forum
- Morgan, M. G. (1993). “Risk Analysis and Management.” *Scientific American* 269(1):32-41.

## Topic 1: Risk Identification and Risk Assessment

### **2. September 7 (M): Labor Day – No Class**

### **3. September 9 (W): Measuring Risk**

#### Readings:

- Hand, D. J. (2008). "[Chapter 4: Probability.](#)" In *Statistics: A Very Short Introduction*, 52-64 New York: Oxford University Press.
- RMS (2015). [Measuring Disaster Risk.](#)

### **4. September 14 (M): Risk Assessments**

#### Readings:

- Apostolakis, G. E. (2004). "How Useful is Quantitative Risk Assessment?" *Risk Analysis* 24(3): 515-520.
- Zscheischler, J. et al (2018). "[Future Climate Risk from Compound Events.](#)" *Nature Climate Change* 8: 469-477.
- National Research Council (2009). [Science and Decisions: Advancing Risk Assessments.](#) Washington, DC: The National Academies Press.  
→ You are only required read Chapter 3, pages 65-73.

### **5. September 16 (W): Uncertainty in Risk Assessment**

#### **Guest Lecture from Roger Cooke, TU Delft and RFF**

#### Readings:

- [Expert Judgement Provides Better Understanding of the Effect of Melting Ice Sheets](#)
- Lempert, R. et al. (2013). [Making Good Decisions Without Predictions.](#) RAND Corporation Research Brief.
- Buurman, J. and Babovic, V. (2016). "[Adaptation Pathways and Real Options Analysis: An Approach to Deep Uncertainty in Climate Change Adaptation Policies.](#)" *Policy and Society* 35: 137-150.

### **6. September 21 (M): Flooding in the U.S.**

#### Readings:

- Flavelle, C. et al. (2020). "[New Data Reveals Hidden Flood Risk Across America.](#)" *New York Times*, June 29.
- Kousky, C. and Golnaraghi, M. (2020). [Flood Risk Management in the United States: Building Flood Resilience in a Changing Climate.](#) Geneva Association, June.
- Milley, P. C. D. et al. (2008). "Stationarity is Dead: Whither Water Management?" *Science* 319(5863): 573-574.

## Topic 2: Risk Perceptions and Risk Communication

### **7. September 23 (W): Behavioral Decision-Making**

#### **Guest Lecture from Howard Kunreuther, University of Pennsylvania**

##### Readings:

- Fox, J. (2015). "[From “Economic Man” to Behavioral Economics.](#)" *Harvard Business Review*.
- Meyer, R. and H. Kunreuther (2017). *The Ostrich Paradox: Why We Underprepare for Disasters*. Philadelphia, PA: Wharton School Press.  
→ *You are only required read Part I.*
- Kluger, J. (2018). "[Why We Keep Ignoring Even the Most Dire Climate Change Warnings.](#)" *Time*, October 8.

### **8. September 28 (M): Comparative Risk Perceptions**

##### Readings:

- Sunstein, C. (2003). "Terrorism and Probability Neglect." *Journal of Risk and Uncertainty* 26(2/3):121-136.
- Loewenstein et al. (2001). "Risk as Feelings." *Psychological Bulletin* 127(2): 267-286.
- Tengs, T. et al. (1995). "Five-Hundred Life-Saving Interventions and Their Cost-Effectiveness" *Risk Analysis* 15(3): 369-390.

### **9. September 30 (W): Risk Communication**

##### Readings:

- Spiegelhalter, D. (2017). "Risk and Uncertainty Communication." *Annual Review of Statistics and Its Application* 4:31-60.
- [The Psychology of Climate Change Communication](#), CRED, 2009.
- Kousky, C. (2018). "[How America Fails at Communicating Flood Risks.](#)" *City Lab*, October 11.

## Topic 3: Structuring a Decision Problem

### **10. October 5 (M): Making Choices with Decision Analysis**

##### Readings:

- National Research Council (2001). "[Basic Tools for Applied Decision Theory,](#)" Chapter 3 in *Theoretical Foundations for Decision Making in Engineering Design*. Washington, DC: The National Academies Press.
- Maguire, L. A. (1991). "Risk Analysis for Conservation Biologists." *Conservation Biology* 5(1): 123-125.

### 11. October 7 (W): Benefit Cost Analysis and Risk Regulation

Readings:

- Viscusi, K. and Aldy, J. (2003). "The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World" *Journal of Risk and Uncertainty* 27: 5-76.
- Arrow, K, J., et al. (1996). "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" *Science* 272(5259): 221-222.
- Kelman, S. "Cost-Benefit Analysis: An Ethical Critique." *Regulation* 5(1): 33-40.
- Flavelle, C. (2020). "A Climate Plan in Texas Focuses on Minorities. Not Everyone Likes It." *New York Times*, July 24.

### 12. October 12 (M): The Politics of Risk and the Risks of Politics

Readings:

- Kamarck, E. (2019). "[The Challenging Politics of Climate Change.](#)" *Brookings*, September 23.
- Nguyet, N. (2019). "[The Perfect Storm: Politics of Disaster Management.](#)" *Berkeley Political Review*, January 4.
- Graham, D. A. (2018). "[Trump's Dubious Revisionist History of Hurricane Maria.](#)" *The Atlantic*, September 12.
- Rice, C. and A. Zegart (2018). "Managing 21<sup>st</sup>-Century Political Risk." *Harvard Business Review*, May-June.

### Topic 4: Risk Management

### 13. October 14 (W): Enterprise Risk Management

Readings:

- Kaplan, R. S. and A. Mikes (2012). "Managing Risks: A New Framework." *Harvard Business Review*, June.
- Disparte, D. (2016). "Simple Ethics Rules for Better Risk Management." *Harvard Business Review*, November 8.
- Stulz, R. M. (2009). "Six Ways Companies Mismanage Risk." *Harvard Business Review*, March.

### 14. October 19 (M): Managing Through a Crisis

Readings:

- D'Auria, G. and De Smet, A. (2020). [Leadership in a Crisis: Responding to the Coronavirus Outbreak and Future Challenges.](#) McKinsey & Company, March 16.
- Boin, A. and P. Hart (2003). "Public Leadership in Times of Crisis: Mission Impossible?" *Public Administration Review* (63)5: 544-553.

### 15. October 21 (W): Public Sector Risk Management

#### Readings:

- Zeckhauser, R. and K. Viscusi (1990). "Risk Within Reason." *Science* 248(4955):559-564.
- Carby, B. (2018). "Integrating Disaster Risk Reduction in National Development Planning: Experience and Challenges of Jamaica." *Environmental Hazards* 17(3): 219-233.
- [UK National Risk Register](#)

### 16. October 26 (M): The Precautionary Principle

#### Readings:

- Foster, Kenneth R., Paolo Vecchia, and Michael H. Repacholi. (2000). "Science and the precautionary principle." *Science* 288.5468: 979-981.
- Taleb, N. N. et al. (2014). "[The Precautionary Principle \(with Application to the Genetic Modification of Organisms\)](#)." Extreme Risk Initiative – NYU School of Engineering Working Paper Series.
- Sunstein, C. (2002-3) "The Paralyzing Principle," *Regulation* (Winter): 32-37

### 17. October 28 (W): Disaster Risk Management in the U.S.

#### Readings:

- Labrador, R. C. (2018). "[U.S. Disaster Relief at Home and Abroad.](#)" Council on Foreign Relations, August.
- Wharton Risk Center (2019). [Improving Disaster Recovery for Low Income Households](#). Wharton Risk Center Digital Dialogue, October.
- SmarterSafer (2019). [A Road Map for Successful US Disaster Policy](#).

### 18. November 2 (M): Horizon Scanning and Scenario Planning

#### Readings:

- Shoemaker, P. J. H. (1995). "Scenario Planning: A Tool for Strategic Thinking." *MIT Sloan Management Review* 36(2): 25-40.
- International Risk Governance Council (2013). [Preparing for Future Catastrophes: Governance Principles for Slow-Developing Risks that May Have Potentially Catastrophic Consequences](#). Concept Note.
- Sutherland et al. (2019). "A Horizon Scan of Emerging Issues for Global Conservation in 2019." *Trends in Ecology & Evolution* 34(1): 83-94.
- Clarke, Lee. "Thinking about Worst-Case Thinking." *Sociological Inquiry* 78.2 (2008): 154-161.4.

**November 3: Election Day: VOTE!**

Topic 5: Risk Transfer

## 19. November 4 (W): Overview of Insurance and Risk Transfer

Readings:

- Kousky, C. (2019). "The Role of Natural Disaster Insurance in Recovery and Risk Reduction" *Annual Review of Resource Economics* 11(3).
- AIR (2014). "[Modeling Fundamentals: Evaluating Risk Measures.](#)" January 23.

## 20. November 9 (M): ILS and Cat Bonds

Readings:

- Polacek, A. (2018). [Catastrophe Bonds: A Primer and Retrospective](#). Chicago Fed Letter, Federal Reserve Bank of Chicago, No. 405.
- Scism, L. and Hinshaw, D. (2020). "Pandemic Insurance for Poor Countries Pays Out \$195.8 Million." *Wall Street Journal*, May 15.
- Cummings, J. D. (2008). "CAT Bonds and Other Risk-Linked Securities: State of the Market and Recent Developments." *Risk Management and Insurance Review* 11(1): 23-47.

## 21. November 11 (W): A Look at Public Insurance: The National Flood Insurance Program Guest Lecture from Paul Huang, Assistant Administrator for Federal Insurance, FEMA

Readings:

- Kousky, C. (2018). "Financing Flood Losses: A Discussion of the National Flood Insurance Program." *Risk Management and Insurance Review*. 21(1): 11-32.

## 22. November 16 (M): Innovations in Risk Transfer for Escalating Extremes

**BLOG/OPED DUE ON CANVAS**

Readings:

- The World Bank Group. [Sovereign Catastrophe Risk Pools](#).
- Colman, Z. (2020). "[Insurance for When FEMA Fails.](#)" *Politico*, July 14.
- The Nature Conservancy (2019). [Insuring Nature to Ensure a Resilient Future](#).
- Casazza, V. (2017). "[7 Things to Know about Peer-to-Peer Insurance Platforms.](#)" *Christian Science Monitor*, February 9.

## Topic 6: Current Risk Challenges

## 23. November 18 (W): Equity and Risk

Readings:

- Hennisz, W. (2020). "[Why We Need a Social Solidarity \(i.e., Wealth\) Tax to Recover from COVID-19.](#)" LinkedIn, April 16.
- Morrison, J. (2019). "[Can We Turn Down the Temperature on Urban Heat Islands?](#)" *Yale Environment 360*, September 12.



#### 24. November 23 (M): Managing Pandemics

Readings:

- Menon, G. (2020). "[How Do Scientists Model the Spread of an Infectious Disease?](#)" *The Wire Science*. March 27.
- Mulligan, C. B. et al. (2020). "[Some Basic economics of COVID-19 Policy.](#)" *Chicago Booth Review*, April 27.

#### 25. November 25: Thanksgiving – No Class

#### 26. November 30 (M): Climate Change Impacts

Readings:

- [The Economic Risks of Climate Change in the United States](#)
- Lustgarten, A. (2020). "[The Great Climate Migration.](#)" *New York Times Magazine*, July 23.
- O'Neill, B. C. et al. (2017). "IPCC Reasons for Concern Regarding Climate Change Risks." *Nature Climate Change*. 7(January):28-37.
- <https://drawdown.org/solutions/> (choose half a dozen to read in detail)

#### 27. December 2 (W): Systemic Threats

Readings:

- Helbing, D. (2013). "Globally Networked Risks and How to Respond." *Nature*. 497(7447).
- Howitt, A. M. and H. B. Leonard (2010) "[Understanding and Coping with the Increasing Risk of System-Level Accidents.](#)" In: *Integrative Risk Management: Advanced Disaster Recovery* edited by S. Woodward. Zurich, Switzerland: Swiss Re, Centre for Global Dialogue, pp. 13-26.
- Futures Platform. [Key Success Factors of a Foresight Program.](#)
- Taleb, N. N. (2007). "[The Black Swan: The Impact of The Highly Improbable.](#)" *New York Times*, April 22.

#### 28. December 7 (M): Our Planet's Life Support Systems

Readings:

- Kolbert, E. (2009). "The Sixth Extinction?" *The New Yorker*, May 18.
- World Economic Forum (2020). [Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy.](#) The New Nature Economy Project, World Economic Forum.
- "[I've Seen a Future Without Cars, And It's Amazing,](#)" *New York Times*, July 9.
- (2020). [The Dasgupta Review – Independent Review on the Economics of Biodiversity. Interim Report.](#) April.

#### 29. December 9 (W): Wrap up