

## Risk Analysis & Environmental Management

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OIDD-2610/ 7610-401

Professor Michael Panfil

Spring 2023

Wednesdays, 3:30-6:30PM EST

LOCATION (TO BE UPDATED)

EMAIL (TO BE UPDATED)

### COURSE DESCRIPTION

This course will introduce students to core concepts, learnings, and frameworks in risk and environmental management, with a focus on climate change-related risks. The class will explore a variety of approaches to risk analysis, drawing from practices across financial actors and economics sectors.

The course is broadly broken into three parts, organized into: (1) risk identification; (2) communicating and framing of risk; and (3) risk management. Classes involve a combination of lecture, student participation, guest lecture, and simulation.

### CLASS LOGISTICS

#### Lectures and virtual learning

The class is held in-person. Absences are excused consistent with school policy. Please do **not** attend if you are ill; your health and the safety of all students is our priority.

Where videos are used, students are not allowed to download and repost or share course videos anywhere. Doing so is a violation of the Code of Academic Integrity.

#### Reading

This class does not use an assigned textbook; readings are free and available online, noted and linked with each class below. All readings are required unless designated as “skim/optional,” which may be discussed briefly in class but are intended primarily to provide additional reading for students interested in a particular topic.

Students are expected to read each required assignment before that day’s class and to be prepared to critically analyze the topics found therein during class discussions. Additional, adjusted, and/or

substitute readings will be assigned during the course of the semester in order to reflect current events or for other reasons.

### Class Participation

Class will use a rotating 'on-call' system. Students are expected to engage in discussion during days when they are on call, however any student is welcome to participate in discussion on days when not on call.

Class will often also involve simulations and group exercises. All students are expected to participate, regardless of whether the student is on-call.

### Quizzes

Four quizzes will be held in-class across the course. Scores from only the student's best three results will count towards the quiz grade.

### Final

The final exam will be 90-minute, closed book. The exam may cover any reading or lecture in the course. A review will be held prior to the final.

### Course Grading

Class participation	30%
Quizzes	20%
Final	50%

## **SCHOOL POLICIES**

Students are to work individually on all assignments unless otherwise indicated. Students are encouraged to discuss course themes and topics with each other, but the final exam and quizzes must be done individually. 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.

(Syllabus on following pages)

## SYLLABUS

### PART 1: RISK IDENTIFICATION

#### **January 18 (Class 1): What is risk analysis and environmental management?**

*The first class will introduce the concept of risk analysis and environmental management, with a focus on risks associated with climate change.*

- **Read:**
  - Chatham House (2021). Climate change risk assessment 2021: <https://www.chathamhouse.org/2021/09/climate-change-risk-assessment-2021/summary> (1 page summary only).
  - Risk Management Strategies in an Uncertain World (2002): [https://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/pdf/roundtable\\_exec\\_final.pdf](https://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/pdf/roundtable_exec_final.pdf) (pg. 3-8)
  - Vicki Bier and Rae Zimmerman. *Risk Assessment of Extreme Events*: [https://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/white\\_papers/bierzimm.pdf](https://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/white_papers/bierzimm.pdf) (1-13, 30-31, 37)
  - Roger Pielke and Dan Sarewitz. *Vulnerability and Risk: Some Thoughts From A Political and Policy Perspective*: [http://sciencepolicy.colorado.edu/admin/publication\\_files/2003.23.pdf](http://sciencepolicy.colorado.edu/admin/publication_files/2003.23.pdf)
  - CMRA. *Climate Mapping for Resilience and Adaptation*: <https://resilience.climate.gov/> (explore website and tools available)
- **Skim/Optional:**
  - World Economic Forum. *The Global Risks Report 2021*: <https://www.weforum.org/reports/the-global-risks-report-2021>
- **Exercise:**
  - Climate-related hazards – data & tools

#### **January 25 (Class 2): Assessing and measuring risk**

*Class two will focus on the risk assessment, and how a climate risk assessment is conducted.*

- **Read:**
  - RMS. *Measuring Disaster Risk* (2015): [https://forms2.rms.com/rs/729-DJX-565/images/UNISDR\\_Sendai.pdf](https://forms2.rms.com/rs/729-DJX-565/images/UNISDR_Sendai.pdf)
  - EPA. *About Risk Assessment*: <https://www.epa.gov/risk/about-risk-assessment>
  - Consolidated Edison. *Climate Change Vulnerability Study* (2019): <https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf>
- **Skim/Optional:**

- National Research Council. Science and Decisions: Advancing Risk Assessments (2009): <https://nap.nationalacademies.org/catalog/12209/science-and-decisions-advancing-risk-assessment> (ch. 3)
- **Exercise:**
  - Conducting a climate risk assessment

### **February 1 (Class 3): Uncertainty and risk**

*Class three grapples with questions of uncertainty and risk – with a focus on departures from historical precedent, correlated risks, and tail risks. Scenario analysis is introduced.*

- **Read:**
  - Milley, P. C. D. et al. (2008). *Stationarity is Dead: Whither Water Management?*: [https://www.law.berkeley.edu/files/CLEE/Milly\\_2008\\_Science\\_StationarityIsDead.pdf](https://www.law.berkeley.edu/files/CLEE/Milly_2008_Science_StationarityIsDead.pdf)
  - GARP Podcast (2021). Adapting to tail risks: surviving the cascading risks from climate change. <https://www.garp.org/podcast/climate-surviving-risks-cr-211216> (listen)
  - James Rising, et al. (2022) *The missing risks of climate change*: <https://www.nature.com/articles/s41586-022-05243-6>
- **Skim/Optional:**
  - Amy Myers Jaffe et al. (2019). *Impact of Climate Risk on the Energy System*: [https://cdn.cfr.org/sites/default/files/report\\_pdf/Impact%20of%20Climate%20Risk%20on%20the%20Energy%20System\\_0.pdf](https://cdn.cfr.org/sites/default/files/report_pdf/Impact%20of%20Climate%20Risk%20on%20the%20Energy%20System_0.pdf) (22-31)
- **Exercise:**
  - Managing uncertainty and scenario analysis

### **February 8 (Class 4): Risk disclosure**

*Class four focuses on the disclosure of risk, centering on the Securities and Exchange Commission's proposed standard that would mandate the disclosure of climate-related financial risk by publicly traded companies.*

- **Read:**
  - Securities and Exchange Commission. *Fact Sheet: Enhancement and Standardization of Climate-Related Disclosures* (2022): <https://www.sec.gov/files/33-11042-fact-sheet.pdf>
  - Romany Webb (2022). *Key elements of the SEC's proposed climate-related disclosure rule*: <https://blogs.law.columbia.edu/climatechange/2022/03/23/key-elements-of-the-secs-proposed-climate-related-disclosure-rule/comment-page-1/>
  - Subodh Mishra, *SEC Climate Disclosure Comments Reveal Diversity of Views* (2022): <https://corpgov.law.harvard.edu/2022/08/31/sec-climate-disclosure-comments-reveal-diversity-of-views/>
  - Jacob Hupart, et al. *What Public Comments on the SEC's Proposed Climate-Related Rules Reveal—and the Impact They May Have on the Proposed Rules* (2022):

<https://www.mintz.com/insights-center/viewpoints/2022-07-20-what-public-comments-secs-proposed-climate-related-rules>

- **Skim/Optional:**
  - Securities and Exchange Commission. *Proposed Rule: The Enhancement and Standardization of Climate-Related Disclosures for Investors* (2022): <https://www.sec.gov/rules/proposed/2022/33-11042.pdf> (emphasis on skim!)
- **Exercise:**
  - None

## PART 2: COMMUNICATING AND FRAMING RISK

### February 15 (Class 5): Decision Problems, valuing risk and cost benefit analysis

*Class Five introduces a variety of approaches to framing risk, with particular focus on cost benefit analysis.*

- **Read:**
  - National Research Council (2001). *Basic Tools for Applied Decision Theory*: <https://nap.nationalacademies.org/read/10566/chapter/5>
  - Viscusi, K. and Aldy, J. (2003). *The Value of a Statistical Life: A Critical Review of Market Estimates Throughout the World*: [https://www.nber.org/system/files/working\\_papers/w9487/w9487.pdf](https://www.nber.org/system/files/working_papers/w9487/w9487.pdf) (skim all, read: 24-29; 36-39; 54-56; 62-69).
  - HBS Online (2019). *How to do a Cost-Benefit Analysis & Why it's Important*: <https://online.hbs.edu/blog/post/cost-benefit-analysis>
  - Congressional Research Service (2021). *Social Cost of Greenhouse Gases*: <https://sgp.fas.org/crs/misc/IF11844.pdf>
- **Skim/Optional:**
  - Steven Kelman (1981). Cost-Benefit Analysis: An Ethical Critique (with replies): <https://www.colby.edu/economics/faculty/thtieten/ec476/kelmanbca.pdf>
  - EPA. Chapter 5: Baseline: <https://www.epa.gov/sites/default/files/2017-09/documents/ee-0568-05.pdf>
  - Lecture Highlights Video (2021) *Cost Benefit Analysis Economics*: <https://www.youtube.com/watch?v=MQQSyX2HRgs>
- **Exercise:**
  - Conducting a cost-benefit analysis and the social cost of greenhouse gases

### February 22 (Class 6): The law and science of climate change

*Class Six centers on the ways science and law communicate and frame climate risk.*

- **Read:**

- Michael Burger, et al. *The Law and Science of Climate Change Attribution* (2020):  
<https://journals.library.columbia.edu/index.php/cjel/article/view/4730/2118>  
(assigned pages TBD)
- **Skim/Optional:**
  - None
- **Exercise:**
  - None

### March 1 (Class 7): System collapse and climate risk

*Class Seven focuses on climate-related risks posed to entire economies, societies, and systems.*

- **Read:**
  - Financial Stability Oversight Council (2021). *Report on Climate-Related Financial Risk*:  
<https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf> (1-36; 89-119; 123-125)
- **Skim/Optional:**
  - Madison Condon (2021). *Market Myopia's Climate Bubble*:  
[https://scholarship.law.bu.edu/faculty\\_scholarship/1087](https://scholarship.law.bu.edu/faculty_scholarship/1087)
  - Blackrock (2020). *A fundamental reshaping of finance*:  
<https://www.blackrock.com/americas-offshore/en/larry-fink-ceo-letter>
- **Exercise:**
  - Risk to the system

### March 8 – NO CLASS SPRING BREAK

### March 15 (Class 8): Hidden risks and communication challenges

*Class Eight considers instances where environmental risks are difficult to communicate or otherwise hidden. Unbundled renewable energy credits and methane leakage are used as case studies.*

- **Read:**
  - Gautam Naik, S&P (2021). *Problematic Corporate Purchases of Clean Energy Credits Threaten Net Zero Goals*: <https://www.spglobal.com/esg/insights/problematic-corporate-purchases-of-clean-energy-credits-threaten-net-zero-goals>
  - Jeff St. John, Canary Media (2022). *A deeper dive into 24/7 carbon-free energy*:  
<https://www.canarymedia.com/articles/energy-markets/a-deeper-dive-into-24-7-carbon-free-energy>
  - Benjamin Storrow, E&E (2020). *Methane Leaks Erase Some of the Climate Benefits of Natural Gas*: <https://www.scientificamerican.com/article/methane-leaks-erase-some-of-the-climate-benefits-of-natural-gas/>
- **Skim/Optional:**

- Zhiyuan Fan, et al. (2022). *Hydrogen Leakage: A Potential Risk for the Hydrogen Economy*: [https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/HydrogenLeakageRegulations\\_CGEP\\_Commentary\\_070722\\_0.pdf](https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/HydrogenLeakageRegulations_CGEP_Commentary_070722_0.pdf)
- **Exercise:**
  - Class-led discussion, examples of hidden risk

### PART 3: MANAGING RISK

#### March 22 (Class 9): Managing risk

*Class Nine revisits the climate vulnerability study, a focus of Class Two, and considers the second step in climate risk management: the implementation of resilience and adaptation.*

- **Read:**
  - Consolidated Edison (2020). *Climate Change Resilience and Adaptation*: <https://cdne-dcxprod-sitecore.azureedge.net/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-resilience-adaptation-2020.pdf?rev=f4447976161a4ce2ad5f4f7788a31628>
  - Romany Webb et al. (2020). *Climate Risks in the Electricity Sector: Legal Obligations to Advance Climate Resilience Planning by Electric Utilities*: <https://law.lclark.edu/live/files/32603-51-3-webbpdf> (582-604).
- **Skim/Optional:**
  - Consolidated Edison. *Climate Change Vulnerability Study* (2019): <https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/climate-change-resiliency-plan/climate-change-vulnerability-study.pdf> (refresh, following original read in Class 2).
- **Exercise:**
  - Implementing a resilience and adaptation plan

#### March 29 (Class 10): Precautionary principle, moral hazards, and scenario analysis

*Class Ten covers a bridges risk management and questions of political economy (the subject of Class Eleven), introducing a variety of approaches and tools relevant to the management of risk.*

- **Read:**
  - IISD (2020). *The Precautionary Principle*: <https://www.iisd.org/system/files/2020-10/still-one-earth-precautionary-principle.pdf>
  - Sunstein, C. (2002-3). *The Paralyzing Principle*: <https://www.cato.org/sites/cato.org/files/serials/files/regulation/2002/12/v25n4-9.pdf>
  - David Victor, et al. (2021). *Inviting Danger*: [https://www.brookings.edu/wp-content/uploads/2021/03/Inviting\\_Danger\\_FINAL.pdf](https://www.brookings.edu/wp-content/uploads/2021/03/Inviting_Danger_FINAL.pdf)
  - TCFD. *Scenario analysis*: <https://www.tcfhub.org/scenario-analysis/>

- **Skim/Optional:**
  - Federal Reserve (2022). *Scenario analysis pilot announced*:  
<https://www.federalreserve.gov/newsevents/pressreleases/other20220929a.htm>
- **Exercise:**
  - Black swan events, the precautionary principle, moral hazards, and scenario planning

### **April 5 (Class 11): Political economy and political risk**

*Class Eleven centers on the ways in which political processes manage risk – and where those processes themselves may themselves introduce new forms of risk.*

- **Read:**
  - Kamarck, E (2019). The Challenging Politics of Climate Change:  
<https://www.brookings.edu/research/the-challenging-politics-of-climate-change/>
  - David Roberts (2020). Interview with Danny Cullenward and David Victor Part I:  
<https://www.volts.wtf/p/why-carbon-pricing-will-never-be>
  - David Roberts (2020). Interview with Danny Cullenward and David Victor Part II:  
<https://www.volts.wtf/p/carbon-offsets-arent-working-and>
  - EIA. Renewable Portfolio Standards Explained:  
<https://www.eia.gov/energyexplained/renewable-sources/portfolio-standards.php>
- **Skim/Optional:**
  - David Roberts (2020). Interview with Danny Cullenward and David Victor Part III:  
<https://www.volts.wtf/p/cap-and-trade-systems-are-not-doing>
  - CESA (2009). Recommended Principles and Best Practices for Renewable Portfolio Standards: <https://www.cesa.org/wp-content/uploads/Principles-Best-Practices-RPS-2.pdf>
- **Exercise:**
  - Lobby day and renewable portfolio standards

## **PART 4: ALLOCATING RISK**

### **April 12 (Class 12): Allocation, as it's meant to be (and when it's not): Risk transfer, insurance and CFTC; public/private risk transfers**

Class Twelve covers best-practice and idealized approaches to the allocation of risk -- and begins examination of instances when allocation of risk can go awry.

- **Read:**
  - Bridget Pals, et al. (2021). *Climate change comes to insurance*:  
<https://thehill.com/opinion/energy-environment/584240-climate-change-comes-to-insurance/>



- CFTC (2022). Request for Information on Climate-Related Financial Risks: <https://www.cftc.gov/sites/default/files/2022/06/2022-12302a.pdf> (only read portion under this heading).
- John MacWilliams et al. (2019). *PG&E: Market and Policy Perspectives on the First Climate Change Bankruptcy*: [https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/PG&E-CGEP\\_Report\\_081519-2.pdf](https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/PG&E-CGEP_Report_081519-2.pdf)
- **Skim/Optional:**
  - New York Department of Financial Services (2021). *Guidance for New York Domestic Insurers on Managing the Financial Risks from Climate Change*. [https://www.dfs.ny.gov/system/files/documents/2021/11/dfs-insurance-climate-guidance-2021\\_1.pdf](https://www.dfs.ny.gov/system/files/documents/2021/11/dfs-insurance-climate-guidance-2021_1.pdf)
- **Exercise:**
  - Allocating risks of climate change

### April 19 (Class 13): When allocation goes wrong: Maladaptation, Frontline communities

Class Thirteen finishes review of misallocation of risk.

- **Read:**
  - Michael Panfil et al. (2021). *Extreme weather is a climate change inevitability; our responses shouldn't worsen the problem*. <https://thehill.com/opinion/energy-environment/580061-extreme-weather-is-a-climate-change-inevitability-our-responses/>
  - Brad Plumer et al. (2020). *How Decades of Racist Housing Policy Left Neighborhoods Sweltering*: <https://www.nytimes.com/interactive/2020/08/24/climate/racism-redlining-cities-global-warming.html>
- **Skim/Optional:**
  - None
- **Exercise:**
  - None

### April 26 (Class 14): Course Review