The Need and Reason for “A Serious Hope”

Climate change is increasing the frequency and severity of many disasters, resulting in loss of lives and livelihoods, and environmental degradation. California, among many regions of the world, has been systematically affected by the impacts of a prolonged drought, devastating wildfires, and occasional extreme precipitation events and floods. While the nature and magnitude of the challenge ahead is severe, it can be tackled through risk management, mitigation, and adaptation. By examining the full “life-cycle” of disasters, this course brings leading UC experts from across our world-class system together to shed their collective light on society’s most critical challenges. With its unmatched collective talents, the University of California offers many reasons for what UCSB Professor Leila Carvalho refers to as a “Serious Hope”.

In this course you will receive an overview of the causes of major disasters (floods, droughts, earthquakes, pandemics, etc.), with a focus on the impacts of these disasters, methods to analyze and measure these impacts, and approaches to prevent them. The purpose is to develop a multidisciplinary understanding of major disasters and how policy can prevent them - or at least reduce the damages they cause. Leaning on the UN's Sendai Framework for Disaster Risk Reduction you will understand what is and can be done in understanding risk; risk reduction; risk governance; and preparedness and resilient recovery. By the end of this 10-week, UC-wide course, you will able to answer the following critical questions:

- What factors contribute to the rising risk of destructive, natural disasters?
- How can an advanced understanding of disasters and risk vulnerability help in improving risk governance and risk reduction?
- What tools are available to build resilient societies that can quickly adapt to these changes?

Natural scientists, medical professors, and social science scholars will help you envision resilience and prevention strategies via case studies and (social-) scientific principles. Their lectures will emphasize scientific concepts in hydrology, geology, epidemiology, and risk management. They will also introduce concepts and analytical frameworks from economics, political science, sociology, and history, emphasizing probabilistic analysis of risky phenomena.

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While this course draws from many disciplines towards a comprehensive understanding of the character and contexts of disasters and resilience, it is not required that you have a background in these fields- only a keen interest. This course is designed to take that interest and hone it from an introductory understanding of a critical social challenge towards further learning and action that is informed by the diverse perspectives offered from: epidemiology and disaster-management; crisis sociology and data informatics; from understanding drought seismic hazards to early assessment and carbon emissions reduction strategies.

Required Prerequisites: none
Sections: Tuesdays, 2:00, 3:00, and 4:00 pm PST
Lectures: synchronous Mondays & Wednesdays, 9:00-10:30 am PST.

LECTURES OUTLINE

INTRODUCTION/WEEK ZERO TO DISASTER RESILIENCE: AN OVERVIEW OF THE UN’S SENDAI FRAMEWORK - (10JAN)
- Preparatory Recorded Material: Dr. Joe Leitmann and Course Overview Dr. David Zilberman
  - Introductory survey
  - For the Sendai Framework, please see: https://www.undrr.org/implementing-sendai-framework/what-sendai-framework

UNDERSTANDING RISK
- WEEK 1: FOOD SECURITY, FOOD SAFETY, COMPLEXITY, TECHNOLOGY AND POLICY Dr. David Zilberman (UC BERKELEY)
  - Guest(s): David Sprague (Berkeley Fire Chief),
  - Readings:

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Zilberman, David. “Risk Assessment and risk management.” Department of Agricultural and Resource Economics, UC Berkeley 2022 (15 pages)


- **Suggested Readings:**
  - **WEEK 2_ WILDFIRES** - Dr. Leila Carvalho (UC SANTA BARBARA)
    - 23JAN: *Discuss factors that play a role in wildfires, and which ones are more relevant in leading to devastating events.* Introduce concepts associated with fire weather and fire weather prediction. Show examples for Santa Barbara County and how coordinated actions (science and operation) can help in preventing disasters. Stimulate discussions among students about topics presented in this lecture.
    - 25JAN: *Guest lecturer will discuss how to build resilience to wildfires through community action.* The discussion will include the Regional Wildfire Preparedness Program and what actions can be taken to increase resilience by improving the built environment, managing the landscape, and building strong relationships with the community.
  - Guest: Nic Elmquist (Fuel Specialist) Montecito Fire department
  - **Readings:**
  - **Suggested Readings:**

- **WEEK 3: FLOODS** - Dr. G. Mathias Kondolf and Dr. Anna Serra-Llobet (UC BERKELEY)
  - 30JAN: *The Origin of Floods: Rain, rivers, and rising seas.* Hydrologic processes generating Floods, flash floods, debris flows, debris floods, downstream...
propagation of floods and non-Newtonian flows. Factors increasing flood risk: it’s not all about more water. Structural measures to “control” floods and their limitations.

- 1FEB: Mapping and managing flood risk. The US National Flood Insurance Program, perception of flood risk and perverse incentives to build on flood-prone land, the inequitable distribution of flood risk and disaster relief, comparing the US approach and with management strategies abroad

- Readings:

- Suggested Readings:

- WEEK 4: EARTHQUAKES Dr. David Oglesby (UC RIVERSIDE)
  - 6FEB: What’s Shaking in California and Beyond (and What it Means for You)
    - Basic physical causes of earthquakes and their strong, dangerous ground motion. Assessment of seismic hazard, and the factors that lead to damage to structures, lifelines, and other infrastructure. Societal mitigations, preparations, and responses for earthquakes, such as proper zoning to avoid earthquake hazard, earthquake-safe structural design, earthquake early warning, and response strategies. Particular attention will be given to the disproportionate effects of earthquakes on underserved communities.
    - Synchronous lecture; recorded for later review
  - 8FEB: How to translate earthquake science to engineering and societal practice
    - Guest(s): Luis Dalguer, 3Q-Lab GmbH, Switzerland

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- Dr. Dalguer is a consultant providing professional service in seismology and earthquake engineering related problems, and is an advisor to the International Atomic Energy Agency (IAEA), participating as leader in international IAEA working groups in the field of seismic hazard and risk assessment.
  - Synchronous lecture; recorded for later review
  - Readings:
  - Suggested Readings:
    - Jones, *The big ones: how natural disasters have shaped us (and what we can do about them)*

RISK REDUCTION

- WEEK 5: Assessing the pandemic [Dr. David Zilberman]
  - 13FEB: *Assessing the Health Effect of the Pandemic*. Prediction of gains from social distancing strategies, estimating probability of death from Covid, the trajectory of decline in fatalities and exposure, assessing trade off between safety and economic activities, evaluation impacts of alternative strategies. Implications for future pandemics
  - 15FEB: *Assessing the economic impacts of the pandemic: Basic principles of supply chain design*. Modeling the impact of the pandemic of the supply chain. Pivoting to new supply management strategies, comparisons between countries, long term impacts on supply chain, assessing and comparing the impact of the pandemic ot droughts
  - Guest(s): [Distinguished Professor Thomas Reardon](https://www.msu.edu) Michigan State University
  - Readings:
    - Zilberman, David, Thomas Reardon, Jed Silver, Liang Lu, and Amir Heiman. "From the laboratory to the consumer: Innovation, supply chain, and adoption with applications to natural resources." *Proceedings of the National Academy of Sciences* 119, no. 23 (2022): e2115880119.
    - Reardon, Thomas, Amir Heiman, Liang Lu, Chandra SR Nuthalapati, Rob Vos, and David Zilberman. "“Pivoting” by food industry firms to cope with

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- Suggested Readings:
  - EXAM/ASSIGNMENT #1

RISK GOVERNANCE (Science + Public Policy)

- WEEK 6: CLIMATE CHANGE - Political Action and Climate-Based Risk [Sarah Anderson](UCSB) (UCSB)
  - 20FEB: Management Agencies and the Public: How agencies manage climate risk, how public actions shape those management strategies.
  - 22FEB: Legislators and Climate-related Disasters: Introduction to public opinion, the legislative process, and legislator responses to the public in disaster preparedness.

  - Readings:

  - Suggested Readings

- WEEK 7: CITIES - Urban Development and Disaster Risk Management [Dr. Joe Leitmann](UC Disaster Resilience Network Executive Director) (UC Disaster Resilience Network Executive Director)
  - 27FEB: Why bother about cities and disaster risks?
  - 1MAR: How can we build resilient cities?
  - Guest(s): TBD

- Readings:

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**RISK RESILIENCE/PREP**

- **WEEK 8: CLIMATE CHANGE - Dr. Sasha Gershunov and Professor Tarik Benmahnia (UCSD; Scripps)**
  - 6MAR: California’s weather and climate extremes on steroids as the world warms: heat waves, drought, extreme precipitation, wildfire, and societal impacts
  - 8MAR: Focusing on heat waves and wildfire smoke and their health impacts
  - Guest(s): TBD
  - Readings: (mainly media pieces for a digestible overview of the topics)
    - Heat waves -- two-pager
    - Heat and health impacts
      - [https://www.who.int/health-topics/heatwaves#tab=tab_1](https://www.who.int/health-topics/heatwaves#tab=tab_1)
    - Atmospheric Rivers and extreme precipitation enhanced by climate change

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Drought and Wildfires on steroids

- [https://www.youtube.com/watch?v=0mCU6-Ts_mc](https://www.youtube.com/watch?v=0mCU6-Ts_mc)

Wildfire smoke pollution and health impacts

- [https://www.npr.org/sections/health-shots/2021/03/05/973848360/study-finds-wildfire-smoke-more-harmful-to-humans-than-pollution-from-cars](https://www.npr.org/sections/health-shots/2021/03/05/973848360/study-finds-wildfire-smoke-more-harmful-to-humans-than-pollution-from-cars)

Bringing it all together -- Mudslides = f(drought, heat, wildfire, extreme rain)

- [https://urldefense.com/v3/__https://www.kneedeeptimes.org/california-reeling/_;/Mih3wA!B9opj2PPok-gbQeq2nxiEOusgl082hMY3ciHck5MgEOufSHxUWdOIR4gkdoF0jmb939Y8Al01KkSKnfiG9r$](https://urldefense.com/v3/__https://www.kneedeeptimes.org/california-reeling/_;/Mih3wA!B9opj2PPok-gbQeq2nxiEOusgl082hMY3ciHck5MgEOufSHxUWdOIR4gkdoF0jmb939Y8Al01KkSKnfiG9r$)

Suggested Readings/Materials:

- **General information on climate change**
  - [https://www.epa.gov/climatechange-science/basics-climate-change](https://www.epa.gov/climatechange-science/basics-climate-change)
  - [https://www.jeffreybennett.com/a-global-warming-primer/](https://www.jeffreybennett.com/a-global-warming-primer/)
  - [https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california](https://scripps.ucsd.edu/research/climate-change-resources/faq-climate-change-california)

- **Peer-reviewed literature for those who want to dig in deeper**


○ EXAM/ASSIGNMENT #2

● WEEK 9: *PANDEMIC - Serendipity, Evolution and Self-Inflicted Wounds* - Dr. Robert T. Schooley (UCSD)
  ○ 13MAR: Asynchronous lecture and video materials: Societal vulnerability to infectious disease risks following disruptions caused by climate, natural disasters and war.
  ○ 15MAR: Lecture, discussion and breakout room discussion: This session will focus on investments in mitigation strategies to reduce infectious disease-related morbidity and mortality in context of societal disruptions outlined in the 13MAR session.
  ○ Guest(s): TBD
  ○ Readings:

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Suggested Readings:
- The Great Influenza by John M. Barry (Free PDF Linked here)

WEEK 10: Cybersecurity, Critical Infrastructure, and Risk Analysis - Dr. Andrew Reddie (UC BERKELEY)
- 20 MAR: Asynchronous video material. Threats and Vulnerabilities in the cyber domain. These videos will focus on the various state- and non-state actors that carry out cyber-attacks, their motives, and how governments have responded.
- 22 MAR: Lecture, discussion, and breakout room discussion. This session will focus primarily on threats and vulnerabilities in the context of national critical infrastructure and how governments are getting to grips with modeling risk in this context.
  - Guest(s): Dr. Jason Reinhardt (Sandia National Laboratories)
  - Readings:
    - Sabotage and War in Cyberspace, Joshua Rovner: Available at https://warontherocks.com/2022/07/sabotage-and-war-in-cyberspace/
    - Cybersecurity for Idiots, Derek Bambauer: Available at https://www.lawfareblog.com/cybersecurity-idiots
  - Suggested Readings:
    - United Kingdom National Risk Register: Available at https://www.gov.uk/government/publications/national-risk-register-2020-
      #:~:text=Documents-,National%20Risk%20Register%202020,-PDF%2C%203.57
    - NIST Cybersecurity Risks: Available at https://www.nist.gov/itl/smallbusinesscyber/cybersecurity-basics/cybersecurity-risks
  - FINAL: GROUP-RESEARCH ASSIGNMENT DUE

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Grading basis
Exams (50%)
   1 Midterm Exam (20%); 1 Final Exam (30%)
Group Assignment (40%)
   A case study research assignment (40%). Students work in groups to pick an area at risk, and write a report about the nature of the risk, what the local government, business community, and NGOs are doing to counter that risk, and making suggestions for further measures that could be taken. Multi-campus and multi-disciplinary groups (of up to 4 students) will be encouraged. Students will have the opportunity to build their own groups or join a pool to be randomly assigned. Students will consult with a graduate student instructor and faculty about the design of their projects.

Participation (10%)
   Attendance and participation in lectures; attendance and contribution to class discussions. Everyone is expected to attend live lectures and/or view all class lectures posted online and participate as directed in sections and other activities. Before each lecture, you will be expected to have completed all assignments in order to engage fully in the week’s theme(s) and discussions. Participants will be asked on occasion to facilitate the discussion in various ways, which we will work out together as we learn together.

Grading scale
A: 90 - 100%
B: 80 – 89%
C: 70 – 79%
D: 60 – 69%
F: Less than 60%

Course content
   · Course content, including assignments, announcements, and reading materials, will be delivered via the Canvas Learning Management System.
   · Synchronous lectures will be delivered using the Zoom platform.
   · Discussion sections will be online and synchronous, hosted by the TA over Zoom.
   · Exams will be online and administered through the ProctorU service to assure academic honesty.

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Both the faculty instructor and TA(s) will have 3 synchronous, online office hours per week delivered over the Zoom platform. In addition, the faculty instructor and TA will monitor an official Slack channel for the course and respond to student queries and engage in student discussion at least once per weekday.

Learning Outcomes
By the end of this course, students will have learned
1. To integrate hazard- and disaster-related concepts from different fields.
2. To develop a multidisciplinary perspective for disaster governance.
3. To recognize global implications of local policies for disaster resilience, and vice versa.
4. How to use a mixed-method (quantitative and qualitative) approach to measures and design of policies.
5. How to interact with multiple constituencies and stakeholders, including academic, government, community, and non-governmental organizations.
6. About the intersectionality between underrepresented groups and disaster risk.
7. The incorporation of diversity, equity, and inclusivity in disaster management.

Academic Integrity
You are a member of an academic community at one of the world's leading research universities. Universities like Berkeley create knowledge that has a lasting impact in the world of ideas and on the lives of others; such knowledge can come from an undergraduate paper as well as the lab of an internationally known professor. One of the most important values of an academic community is the balance between the free flow of ideas and the respect for the intellectual property of others. Scholars and students always use proper citations in papers; professors may not circulate or publish student papers without the writer's permission; and students may not circulate or post materials (handouts, exams, syllabi--any class materials) from their classes without the written permission of the instructor.

Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course unless you obtain prior written approval to do so from your instructor. In all of your assignments, including your homework or drafts of papers, you may use words or ideas written by other individuals in publications, web sites, or other sources, but only with proper attribution. If you are not clear about the expectations for completing an assignment or taking a test or examination, be sure to seek clarification from your instructor or Graduate Student Instructor/Teaching Assistant beforehand. Finally, you should keep in mind that as a member of

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the campus community, you are expected to demonstrate integrity in all of your academic endeavors and will be evaluated on your own merits. The consequences of cheating and academic dishonesty—including a formal discipline file, possible loss of future internship, scholarship, or employment opportunities, and denial of admission to graduate school—are simply not worth it.

Collaboration and Independence: Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do together with one's fellow students. We recommend this. Group assignments are assumed to have equal contributions from all group members. However, any individual assignments should be completed independently should be the result of one's own independent work.

Cheating: Anyone caught cheating on a quiz or exam will receive a failing grade and will also be reported to the University Office of Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

Plagiarism/Self-plagiarism: You must be original in composing the writing assignments in this class. To copy text or ideas from another source (including your own previously, or concurrently, submitted coursework) without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism, self-plagiarism, and how to avoid it, see, for example:

http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism
http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html

Academic Integrity and Ethics: Cheating on exams and plagiarism are examples of violations in the realm of ethics and integrity. Honesty, integrity, and ethical behavior are of great importance in all facets of life. They are so important that it is generally assumed that one has learned and internalized these qualities at an early age. As a result, these issues rarely get explicitly addressed by the time one gets to be a university student. However, it cannot be overstated just how important honesty is to the academic enterprise.

Turnitin: UC Berkeley's honor code states "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others." As a tool to promote academic integrity in this course, written work submitted via bCourses may be checked for originality using Turnitin. Turnitin compares student work to a database of books, journal articles, websites, and other student papers. This creates an opportunity for students to improve their academic writing skills, by ensuring that other sources have been properly cited and

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attributed. For more information about Turnitin at UC Berkeley, visit 
http://ets.berkeley.edu/academic-integrity(link is external).

Policy on Academic Dishonesty/ Berkeley Campus Code of Student Conduct(link is external)

Resources on promoting Academic Integrity

Academic Accommodations:

The purpose of academic accommodations is to ensure that all students have a fair chance at 
academic success. If you have Letters of Accommodations from the Disabled Students’ Program 
or another authorized office, please share them as soon as possible, and we will work out the 
necessary arrangements. While individual circumstances can vary, requests for 
accommodations often fall into the categories listed on the Academic Calendar and 
Accommodations website. All UC campuses have well-developed processes in place for 
students to request accommodations, and you are encouraged to contact the relevant campus 
offices listed on the Academic Accommodations Hub at UC Berkeley, and equivalent resources 
as other campuses. (https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub). These offices, 
some of which are confidential, can offer support, answer questions about your eligibility and 
rights, and request accommodations on your behalf, while maintaining your privacy.

UC Berkeley Student Advocate's Office [Confidential]:

Provides free, confidential, student-to-student assistance for Berkeley undergraduate and 
graduate students navigating issues with academics, financial aid, accusations of misconduct, 
instances of harassment and discrimination, and other grievances within the scope of the 
university.

Phone: (510) 642-6912 | Website: https://advocate.berkeley.edu/ | Email: help@berkeleysao.org

UC Online students from other campuses should contact their own local equivalents to this 
office for assistance.

Ombuds Office for Students and Postdoctoral Appointees [Confidential]:

Confidential conflict resolution services, coaching, referrals, clarifying policies and procedures. 
Empowering students to make informed decisions with the goal of resolutions that meet their 
needs.

Phone: (510) 642-5754 | Website: https://sa.berkeley.edu/ombuds

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Syllabus is a Contract and Subject to Change:

This syllabus is a contract that you, as an enrolled student in this course, agree to abide by throughout the semester. You agree to complete the assignments in a timely manner in accordance with the schedule printed in the syllabus and to participate in the class using proper student conduct and netiquette. As part of this agreement, your responsibilities are printed clearly within this syllabus with deadlines so that you will know well in advance when readings and assignments are due. The syllabus is also subject to change if deemed necessary by the instructor. You will be afforded ample warning before any new responsibility or assignment is due. Most often, a change to the syllabus will constitute a minor change in reading materials or the cancellation of a day of class. If such a change occurs, a revised syllabus will be made available to students and replace any old copies of the syllabus.

- UC Disaster Resilience Executive Director Dr. Joe Leitmann, in an initial session, will introduce key course terms and its structure, which is based on the Sendai Framework for Disaster Risk Reduction. In a subsequent session he will look at issues and options that are specific to urban resilience.
- UC Berkeley Professor (and course lead) David Zilberman covers the basics of risk assessment and modeling probabilistic distribution of pandemics and famine based on basic formulas and procedures of toxicology and epidemiology. He also covers basic modeling behind water systems movement and irrigation system design building on hydrology, climatology, and engineering as we deal with droughts.
- UC Riverside Professor (and course co-lead) David Oglesby presents the basic physical causes of earthquakes and their strong, dangerous ground motion. He will then go on to address the assessment of seismic hazard, and the factors that lead to damage to structures, lifelines, and other infrastructure. He will conclude by discussing societal mitigations, preparations, and responses for earthquakes, such as proper zoning to avoid earthquake hazard, earthquake-safe structural design, earthquake early warning, and response strategies.
- UC Santa Barbara Professor Sarah E. Anderson will show how agencies distribute disaster resources and how the public engagement process with both agencies and legislators can shape preparedness and response to disasters.
- UC Santa Barbara’s Professor Leila Carvalho will introduce the basic forces and phenomena driving the spread of fires over space and time and how they affect fire protection strategies. Nic Elmquist of the Montecito Fire Department will join her as a

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guest, offering a practical overview on wildfires and to discuss actions to mitigate and prevent wildfire hazards at community level.

- Dr. Andrew Reddie (UC BERKELEY) will address the risks posed by emerging technologies—with a focus on how to measure, analyze, and model cybersecurity risks and vulnerabilities.

- UC San Diego Scripps Institution’s Dr. Sasha Gershunov and Professor Tarik Benmahnia will look at the basic phenomena driving climate change and the science behind confronting it.

- UC Berkeley Professors G. Mathias Kondolf and Dr. Anna Serra-Llobet will present the basic scientific principles behind generating runoff and driving flood dynamics, as well as distinctions among clear-water floods, debris flows, and debris floods, and the distinctive attributes of flash floods typical of alluvial fan environments. Complementing an understanding of these physical processes, they will explain the current management and regulatory approach in the US, dominated by flood control structural works and flood insurance, and highlight the importance of land use planning to reduce flood risk.