

Urban Climate Solutions

Urban Design and Planning URBDP 498D/598I, Spring Quarter 2022

Class: Mondays and Wednesdays, 1:30 – 2:50 pm, Gould Hall room 100

Instructor: Prof. Jan Whittington, janwhit@uw.edu

Office hours: Prof. Whittington, M 3pm, Th 11am, Zoom: <https://washington.zoom.us/j/2518631338>

Course Webpage: <https://canvas.uw.edu/courses/1549278>

Course Catalog Description: Climate mitigation and adaptation solutions and their implementation for urban built environments at the project, system, and city scale.

Course Objective: Urban built environments are the key to solving the climate crisis. Considering the lifespan of energy, building, transportation, wastewater, industrial, and solid waste infrastructure, investments today determine a city's capacity to address mitigation and adaptation for decades to come. In our urban settings, these sources of the problem can be redesigned and given new institutional frameworks to become solutions. Over 90 percent of emissions from cities can be eliminated with the technologies available today, and our understanding of the impact of a changing climate on the magnitude and frequency of hazards is creating options for designing and delivering decarbonized (CO₂e) and resilient urban projects and systems. These solutions and the institutions governing their adoption and financing for implementation in cities are the subject of this course.

The goal of this course is for students to understand climate considerations in context across the scales of the built environment, from the project to the system and the city level. Through four distinct modules, this course provides a framework for problem-solving through the various scales, technologies, designs, markets, policies, and financing mechanisms that cities and urban areas must pursue in order to achieve carbon zero, climate resilient urbanization. Through this course, students will explore the conditions needed within cities to allow, attract, and leverage climate finance to achieve a timely transition for climate resilient urban infrastructure. While this course is designed for students of the disciplines of the built environment, including engineering, students from all disciplines are welcome. A basic understanding of public policy, infrastructure planning, and economics is recommended. However, there are no prerequisites for graduate students, and undergraduates with advanced standing may register.

Texts: Boswell, M., Greve, A. and Seale, T. (2019). *Climate Action Planning*. Island Press.

<https://islandpress.org/books/climate-action-planning>

Henson, R. (2019). *The Thinking Person's Guide to Climate Change (2nd ed)*. Boston: American Meteorological Society. <https://bookstore.ametsoc.org/catalog/book/thinking-persons-guide-climate-change-2-ed>

Recommended: [The Chicago Manual of Style](#), 17th Edition in print and online at the UW Library.

Structure: This is a synchronous mid-sized lecture class with assignments. The course is divided into four sections, with three main assignments. Two of the main assignments will be conducted in small groups. In addition, there will be five short essay exams based on the readings, and the lowest of these scores will be dropped. Late work will not be accepted.

Grading: Grading is on points accumulated (not a curve). Points possible (400 points = 4.0 grade):

Short essay exams (30 mins each)..... 100 Sector Mitigation Assignment..... 100

Demonstration Project Assignment..... 100 City Climate Impact Assignment..... 100

Welcome: Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at disability.uw.edu.

Course Information and Communication: Course content and communication are through in-class meetings (lectures and activities) and through Canvas. Canvas is not the best system we have seen, but we are using it because it is governed by a formal agreement (a service level agreement) between the UW and the company that owns Canvas, which assists UW in managing the software in ways that protect students, including compliance with FERPA, the U.S. law that protects student privacy. Check these features regularly:

- **Zoom** for links to Professor office hours. If you are logged in with your UW account, your use of Zoom is protected by a formal service level agreement with the UW and is FERPA compliant To sign in to Zoom using your UW account, visit: <https://washington.zoom.us/> (for more information about UW Zoom’s use of data, see <https://itconnect.uw.edu/connect/phones/conferencing/zoom-video-conferencing/uw-zoom-faq/privacy/>). Please note that as a UW student, you also have an account on Zoom for your own use.
- **Canvas Modules** for access to course content. See also Canvas Home and Syllabus pages. Modules are used to organize assignments, discussions, G-suite, exams, and other course content.
- **Zoom** after class hours to access recorded lectures. Lectures that occur during class meetings will be recorded on Zoom and available for viewing after class from the Canvas Zoom page.
- **G-Suite**, such as Google Docs and Google Presentations, for activities in class. Make sure that you are logged in to Google through your UW net ID (your UW email address) in order to access these materials. If you access Google using your UW account, your use of G-Suite products will also be governed by a formal agreement (a service level agreement) between UW and Google (Alphabet), to comply with FERPA and protect privacy.
- **Canvas Announcements** for messages that apply to all students. Check regularly.
- **Canvas Grade** page for points earned on each assignment. Note that the percentages in Canvas are not correct, and do not rely on those to estimate your grade.
- **Canvas Inbox** to email your Professor. Provide a reason for the message in the subject line. Use Canvas Inbox for all confidential communications or to protect privacy.

Grading: Graded assignments in this course are organized into four categories. All grades are a result of the sum of point scores, as follows. **Use of outside websites or expertise (such as Course Hero) is strictly prohibited.**

Short essay exams:	100 total possible
Five exams (administered in class, focused on readings)	25 points each (drop one)
Demonstration Project Report (Group):	100 total possible
Project Selection	5 points
Group Report Grade	75 points
Peer Review	20 points
Sector Mitigation Assignment (Group):	100 total possible
Part 1	20 points
Part 2	30 points
Part 3	30 points
Peer Review	20 points
City Climate Impact Assignment (Group):	100 total possible
Proposed Projects	10 points
Group Report Part 1	35 points
Group Report Part 2	35 points
Peer Review	20 points

Absence from Class: Students are expected to attend class and to participate in all graded activities, including midterms and final examinations. A student who is anticipating being absent from class due to a Religious Accommodation activity needs to complete the Religious Accommodations request process by the second Friday of the quarter. Students who anticipate missing class due to attendance at academic conferences or field trips, or participation in university-sponsored activities should provide a written notice to the instructor ahead of the absence. The instructor will determine if the graded activity or exam can be rescheduled or if there is equivalent work that can be done as an equivalent, as determined by the instructor.

Course Objectives:

In this course we will examine:

- The science of urban greenhouse gas emissions and climate change
- The scientific basis for setting city greenhouse gas emission reduction targets
- Anticipated impacts of climate change on global to local systems
- Common contents of city climate action plans
- Implementation of climate action plans
- Climate justice and environmental health in the context of city climate action
- Potential for reducing greenhouse gas emissions
- Potential actions for adapting to climate change impacts
- Methods for greenhouse gas emissions inventorying, accounting, and forecasting
- Methods for vulnerability assessment and prioritizing adaptation needs
- Methods for integrating climate action into city capital plans and budgets
- Reporting for climate finance, green bond finance, and ESG finance
- The implications of climate action planning for comprehensive city plans
- Effects of state, federal, and international policy on city climate action

Students who excel in this course will be able to:

- Define the science and impacts of climate change on cities and urban systems
- Conduct basic greenhouse gas emissions accounting
- Conduct a basic climate vulnerability assessment
- Identify, assess, and implement actions for reducing greenhouse gas emissions
- Identify, assess, and implement actions for adapting to climate change impacts
- Prepare goals and objectives for a local climate action plan

Descriptions of Assignments:

Assignment 1: Demonstration Project Assignment Research and write a report on an infrastructure or public service climate-focused demonstration project of your choice. Local inspiration: The Bullitt Center (<https://bullittcenter.org/>)

Assignment 2: Sector Mitigation Assignment This assignment is intended to help you try your hand at the technical skill of greenhouse gas accounting, which is critical for understanding and evaluating climate action plan implementation, and measuring progress toward meeting emission reduction targets. There are several discrete components to the assignment aimed at developing different skills. One essential component of being successful in this emerging field is the ability to find data and information and solve problems that don't have completely clear methods. Estimate, with the use of a variety of tools and methods, greenhouse gas emissions reductions and related cost implications by assessing three hypothetical strategies for a given city, referring to that city's greenhouse gas emissions inventory, *Quantifying Greenhouse Gas Mitigation Measures* (CAPCOA, December 2021), and one or more additional models, such as my Climate-Smart CIP and Green Revolving Fund models.

Assignment 3: City Climate Impact Assignment Research and present a city-scale analysis of climate impacts, efforts to enhance resilience, and opportunities for adaptation. Students should be prepared to identify where along the stages of climate smart urbanization and investment planning their selected city falls, and provide an overview of past and current efforts in planning for the impacts of climate change. For the main section of the report, select at least one focal climate related disaster and explain in depth the impacts likely to occur for the city's infrastructure and population. Provide reasoning, evidence, and sources for your estimates. Explain the role of climate change in exacerbating the magnitude and frequency of the climate impact. Consider climate justice, and the differential capacity of people in society to adapt to the impact. Consider proposed and/or implemented strategies for adaptation and resilience to city infrastructure and in support of vulnerable and disadvantaged city populations. Conclude with recommendations. Potential examples of cities and impacts to consider include:

- New York, New York or New Orleans, Louisiana (Hurricane, Storm Surge, and Sea Level Rise)
- South Lake Tahoe, California or Spokane, Washington (Wildfire)
- Kansas City, Missouri (Tornados)
- Phoenix, Arizona or Chicago, Illinois (Urban Heat Island Effect)
- Miami, Florida (Sea Level Rise and King Tides)

Academic Integrity: The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you're uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have. Acts of academic misconduct may include but are not limited to:

- **Cheating** (working collaboratively on quizzes/exams and discussion submissions, sharing answers and previewing quizzes/exams)
- **Unauthorized collaboration** (working with each other on assignments)
- **Plagiarism** (representing the work of others as your own without giving appropriate credit to the original author(s)). This constitutes plagiarism whether it is intentional or unintentional. I advise each of you to read a style manual in order to learn how to avoid plagiarism. Accurate use of references and citation style, in conformance with the Chicago Manual of Style (17th Edition), will constitute a significant portion of writing and presentation grades.

Cheating, unauthorized collaboration, and plagiarism may lead to disciplinary action by the University against the student who submitted the work. Students found to have engaged in academic misconduct may receive a zero on the assignment. The University of Washington Student Conduct Code (WAC 478-121) defines prohibited academic and behavioral conduct and describes how the University holds students accountable as they pursue their academic goals. Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by the Associate Dean for Academic Affairs, the College of Built Environments. More information can be found online at <https://www.washington.edu/studentconduct/>.

Religious Accommodations: Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy \(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form \(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/).

Face Coverings: The health and safety of the University of Washington community are the institution's priorities. Please review and adhere to the [UW COVID Face Covering Policy \[pdf\]](#).

Campus Safety: Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus's team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

Title IX: UW, through [numerous policies](#), prohibits sex- and gender-based violence and harassment, and we expect students, faculty, and staff to act professionally and respectfully in all work, learning, and research environments. For support, resources, and reporting options related to sex- and gender-based violence or harassment, visit [UW Title IX's webpage](#), specifically the [Know Your Rights & Resources](#) guide. Please know that if you choose to disclose information to me (your Professor) about sex- or gender-based violence or harassment, I will connect you (or the person who experienced the conduct) with resources and individuals who can best provide support and options. You can also access those resources directly:

- Confidential: [Confidential advocates](#) will not share information with others unless given express permission by the person who has experienced the harm or when required by law.
- Private and/or anonymous: [SafeCampus](#) provides consultation and support and can connect you with additional resources if you want them. You can contact SafeCampus anonymously or share limited information when you call.

Please note that some senior leaders and other specified employees have been identified as [“Officials Required to Report.”](#) If an Official Required to Report learns of possible sex- or gender-based violence or harassment, they are required to call SafeCampus and report all the details they have in order to ensure that the person who experienced harm is offered support and reporting options.

Title IX website: <https://www.washington.edu/titleix/>

Support and help page: <https://www.washington.edu/titleix/resources/>

Confidential advocates: <https://www.washington.edu/sexualassault/support/advocacy/>

SafeCampus: <https://www.washington.edu/safecampus/>

Officials Required to Report: <https://www.washington.edu/titleix/title-ix-officials-required-to-report/>

Related policies: <https://www.washington.edu/titleix/policies/>

Course Schedule

Date	Topic	Readings
Mar 28 1:1	Problem Global Greenhouse Gas Emissions	<p>Required for All:</p> <p>Syllabus</p> <p>Henson, R. 2019. [Part 1: The Basics, Global Warming in a Nutshell, Chapters 1, 2, and 3]</p> <p>Scripps Institute of Oceanography, CO₂. “Keeling curve lessons” Scripps CO₂ Program, Accessed: August 1, 2018. https://scrippsco2.ucsd.edu/history_legacy/keeling_curve_lessons.html</p> <p>William J. Ripple, Christopher Wolf, Thomas M. Newsome, Mauro Galetti, Mohammed Alamgir, Eileen Crist, Mahmoud I. Mahmoud, William F. Laurance, 15,364 scientist signatories from 184 countries, World Scientists’ Warning to Humanity: A Second Notice, <i>BioScience</i>, Volume 67, Issue 12, December 2017, Pages 1026–1028, https://doi.org/10.1093/biosci/bix125</p> <p>Plus for Grad Students:</p> <p>Mann, M.E., R.S. Bradley and M.K. Hughes (1998), “Global-scale temperature patterns and climate forcing over the past six centuries”, <i>Nature</i>, 392, 779–87.</p> <p>Recommended for All:</p> <p>University of Chicago. Press. 2006. “The Chicago Manual of Style Online.” Chicago: University of Chicago Press. (Table of Contents and sections 14.1-14.5, 15.1-15.9)</p>
Mar 30 1:2	Problem Global Greenhouse Gas Mitigation	<p>Required for All:</p> <p>IPCC, 2021: Summary for Policymakers. In: <i>Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change</i> [Masson-Delmotte, V., et al. (eds.)]. In Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf [Read summary statements in bold, figures, tables & boxes]</p> <p>United Nations Environment Programme (2021). <i>Emissions Gap Report 2021: The Heat Is On – A World of Climate Promises Not Yet Delivered – Executive Summary</i>. Nairobi. [Read Executive Summary: https://wedocs.unep.org/bitstream/handle/20.500.11822/36991/EGR21_ESEN.pdf] For the full report: https://www.unep.org/resources/emissions-gap-report-2021</p> <p>United Nations Climate Change. “What is the Paris Agreement?” United Nations Framework Convention on Climate Change (UNFCCC), 2018. https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement [Download and skim the Authentic Texts of the Paris Agreement]</p> <p>Plus for Grad Students:</p> <p>Global Climate Project. “Home”. https://www.globalcarbonproject.org/index.htm [Browse Global Carbon Budget]</p> <p>Climate Trace. Bringing Radical Transparency to Global Emissions. Climatetrace.org, November 1, 2021. file:///C:/Users/janwhit/Desktop/ClimateTRACE_BringingRadicalTransparencytoGlobalEmissions_ExecutiveSummary.pdf [Browse ClimateTRACE’s home page: https://www.climatetrace.org/]</p> <p>Recommended for All:</p> <p>Henson, R. 2019. [Chapter 14]</p> <p>Rich, Nathaniel. “Losing Earth” New York Times, August 1, 2018. https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html#main (Also available through UW Libraries, online access through Gale Cengage Literature Resource Center, http://link.galegroup.com/apps/doc/A548925001/LitRC?u=wash_main&sid=LitRC&xid=04e6d5a3).</p> <p>National Research Council. 1979. <i>Carbon Dioxide and Climate: A Scientific Assessment</i>. Washington, DC: The National Academies Press. https://doi.org/10.17226/12181 [Foreword (vii-viii), Preface (ix-x), 1 Summary and Conclusions (1-3), 2 Carbon in the Atmosphere (4-6)]</p> <p><i>Kyoto Protocol to the United Nations Framework Convention on Climate Change</i>. United Nations. 1997. https://unfccc.int/sites/default/files/resource/docs/cop3/107a01.pdf</p>
Apr 4 2:1	Problem Global and US Climate Impacts Guest Lecture Adrienne Greve	<p>Required for All:</p> <p>IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, et al. (eds.)]. In: <i>Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change</i> [H.-O. Pörtner, et al. (eds.)]. Cambridge University Press. In Press. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf [Read summary statements in bold, figures, tables & boxes]</p> <p>Hayhoe, K., et al., 2018: Our Changing Climate. In <i>Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II</i> [Reidmiller, D.R., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 72–144. doi:10.7930/NCA4.2018.CH2 https://nca2018.globalchange.gov/downloads/NCA4_Ch02_Changing-Climate_Full.pdf [Page 86 – 102]</p> <p>NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). https://www.ncdc.noaa.gov/billions/, DOI: 10.25921/stkw-7w73 See: https://www.ncdc.noaa.gov/billions/mapping</p>

US FEMA. 2022. National Risk Index. <https://hazards.fema.gov/nri/map>

US EPA. EJScreen: Environmental Justice Screening and Mapping Tool. <https://www.epa.gov/ejscreen>

Plus for Grad Students:

Alder, J. R. and S. W. Hostetler, 2013. USGS National Climate Change Viewer. US Geological Survey. <https://doi.org/10.5066/F7W9575T>

Recommended for All:

Intergovernmental Panel on Climate Change (IPCC), 2018. *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, et al. (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp. <https://www.ipcc.ch/sr15/> [Summary for Policymakers]

Apr 6
2:2
**Problem
Cities and
Climate
First Exam**

Required for All:

World Bank. 2021. *State of Cities Climate Finance 2021 Part 2: The Enabling Conditions for Mobilizing Urban Climate Finance*. © World Bank. License CC BY 3.0 IGO. 93 pages. [authored by S. Boukerche, D. Mason, J. Boex, and J. Whittington] <https://citiesclimatefinance.org/wp-content/uploads/2021/06/2021-State-of-Cities-Finance-Part-2.pdf> [Part 1, Part 2, and Part 6] For the whole report: <https://citiesclimatefinance.org/publications/2021-state-of-cities-climate-finance/>

Coalition for Urban Transitions. 2019. "Climate Emergency, Urban Opportunity" <https://urbantransitions.global/en/publication/climate-emergency-urban-opportunity/> [Executive Summary]

Rosenzweig, C., Solecki, W., Romero-Lankao, P., Mehrotra, S., Dhakal, S., & Ali Ibrahim, S. (Eds.). (2018). *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press. <https://uccrn.ei.columbia.edu/arc3.2> [Chapter 1 - Pathways to Urban Transformation]

Plus for Grad Students:

WBGU – German Advisory Council on Global Change (2016): *Humanity on the move: Unlocking the transformative power of cities*. Berlin: WBGU. <https://www.wbgu.de/en/publications/publication/humanity-on-the-move-unlocking-the-transformative-power-of-cities> [Section 2.5-3.0, pages 95-126]

Recommended for All:

Boswell et al., [Chapter 2]

Apr 11
3:1
**Energy
Assignment 1:
Demonstration
Project Selection
Due**

Required for All:

Henson, R. 2019. [Chapter 16]

McKay, D. Sustainable Energy – Without the hot air (a 10 page synopsis).

<https://www.withouthotair.com/synopsis10.pdf> For the full book:

<http://www.inference.org.uk/sustainable/book/tex/sewtha.pdf>

Marcotullio, P. J., et al. (eds.), *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press. New York. 443–490.

https://uccrn.ei.columbia.edu/sites/default/files/content/pubs/ARC3.2-PDF-Chapter-12-Energy-Transformation-wecompress.com_.pdf [Energy Transformation in Cities, Section 12.5 pages 162-182]

Larsen, J., King, B., Kolus, H., Herndon, W. "Pathways to Build Back Better: Investing in 100% Clean Electricity" Rhodium Group, March 3, 2021. <https://rhg.com/wp-content/uploads/2021/03/Pathways-to-Build-Back-Better-Investing-in-100-Clean-Electricity.pdf>

Plus for Grad Students:

Marcotullio, P. J., et al. 2018: Chapter 3: Energy systems. In *Second State of the Carbon Cycle Report (SOCCR2): A Sustained Assessment Report* [Cavallaro, N., et al. (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 110-188, <https://doi.org/10.7930/SOCCR2.2018.Ch3>. https://carbon2018.globalchange.gov/downloads/SOCCR2_Ch3_Energy_Systems.pdf [3.1 to 3.4 end on page 140, 3.5 to 3.9 end on page 168]

Recommended for All:

Zamuda, C., D.E. Bilello, G. Conzelmann, E. Mecray, A. Satsangi, V. Tidwell, and B.J. Walker, 2018: Energy Supply, Delivery, and Demand. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., et al., (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 174–201. doi: 10.7930/NCA4.2018.CH4, https://nca2018.globalchange.gov/downloads/NCA4_Ch04_Energy_Full.pdf

Martinich, J., et al., 2018: Reducing Risks Through Emissions Mitigation. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., et al., (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 1346–1386. doi: 10.7930/NCA4.2018.CH29 https://nca2018.globalchange.gov/downloads/NCA4_Ch29_Mitigation_Full.pdf

Apr 13
3:2
**Buildings
Guest Speaker:
Rob Peña**

Required for All:

Henson, R. 2019. [Chapter 18]

Bossink, Bart A. G. "Demonstration Projects for Diffusion of Clean Technological Innovation: A Review." *Clean Technologies and Environmental Policy* 17, no. 6 (August 1, 2015): 1409–27.

<https://doi.org/10.1007/s10098-014-0879-4>

Kaufman, W. 2013. "This building is supergreen: Will it be copied?" NPR.

<https://www.npr.org/2013/04/22/177455916/this-building-is-supergreen-will-it-be-copied> [Podcast and Transcript]

Peña, R. 2014. "Living Proof: The Bullitt Center, High Performance Building Case Study. University of Washington, Center for Integrated Design. <https://bullittcenter.org/wp-content/uploads/2015/08/living-proof-bullitt-center-case-study.pdf>

Plus for Grad Students:

Cui, W., et al., 2021. "Co-Benefits Analysis of Buildings Based on Different Renewal Strategies: The Energy-Lca Approach." *International Journal of Environmental Research and Public Health* 18 (2): 592.

<https://doi.org/10.3390/ijerph18020592>

Recommended for All:

Climate-KIC. N.D. Deep Demonstrations. <https://www.climate-kic.org/programmes/deep-demonstrations/>

Arthur WB (2009) *The Nature of Technology: What it is and How it Evolves*. The Free Press, New York

Chen W., A. Engels, Z. Wang. 2018. Overview of research on China's transition to low-carbon development: The role of cities, technologies, industries and the energy system. *Renewable and Sustainable Energy Reviews*, 81 (1): 1350-1364. <https://doi.org/10.1016/j.rser.2017.05.099>

Apr 18
4:1

Urbanization

Gurney, K. R., et al., 2018: Chapter 4: Understanding urban carbon fluxes. In *Second State of the Carbon Cycle Report (SOCCR2): A Sustained Assessment Report* [Cavallaro, N., et al., (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 189-228, <https://doi.org/10.7930/SOCCR2.2018.Ch4>

World Bank. 2021. *State of Cities Climate Finance 2021 Part 2: The Enabling Conditions for Mobilizing Urban Climate Finance*. © World Bank. License CC BY 3.0 IGO. 93 pages. [authored by S. Boukerche, D. Mason, J. Boex, and J. Whittington] <https://citiesclimatefinance.org/wp-content/uploads/2021/06/2021-State-of-Cities-Finance-Part-2.pdf> [Parts 4 and 5]

Fay, M., S. Hallegatte, A. Vogt-Schilb, J. Rozenberg, U. Narloch, and T. Kerr. 2015. Decarbonizing Development: Three Steps to a Zero-Carbon Future. Climate Change and Development. Washington, DC: World Bank. doi:10.1596/978-1-4648-0479-3. License: Creative Commons Attribution CC BY 3.0 IGO <https://openknowledge.worldbank.org/handle/10986/21842> [Overview, end on page 22]

Plus for Grad Students:

TBD

Recommended for All:

Coalition for Urban Transitions. 2019. "Climate Emergency, Urban Opportunity" <https://urbantransitions.global/en/publication/climate-emergency-urban-opportunity/> [Chapters 2 and 3]

Apr 20
4:2

GHG Inventories & Targets

Boswell et al., 2019 [Chapter 4]

California Air Pollution Control Officers Association (CAPCOA). 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Final Draft, December, 2021. https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf [Chapter 1 and for the assignments and in-class exercises Chapter 3]

World Resources Institute (WRI). Greenhouse Gas Protocol. <https://www.wri.org/initiatives/greenhouse-gas-protocol> [Browse and compare the protocols, guidance and tools] Go to "Policy and Action Standard" <https://ghgprotocol.org/policy-and-action-standard> [Read parts 1-4, end on page 33]

Plus for Grad Students:

CalEEMod (California Emissions Estimator Model). <http://www.aqmd.gov/calceemod/home> Download Model. <http://www.aqmd.gov/calceemod/download-model> User's Guide. <http://www.aqmd.gov/calceemod/user's-guide>

Recommended for All:

Boswell et al., 2019 [Chapter 5]

Apr 25
5:1

Transportation

Henson, R. 2019. [Chapter 19]

Mehrotra, S., et al., (2018). Urban transportation. In Rosenzweig, C., et al., (eds.), *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge University Press. New York. [Chapter 13: Introduction and 13.1 pages 491-493 and 13.4 pages 501-518] https://uccrn.ci.columbia.edu/sites/default/files/content/pubs/ARC3.2-PDF-Chapter-13-Urban-Transportation-wecompress.com_.pdf

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Plus for Grad Students:

		TBD
		<p>Recommended for All:</p> <p>Popovich, N. and B. Plumer. “Can Portland be a climate leader without reducing driving?” New York Times, April 21, 2022. https://www.nytimes.com/interactive/2022/04/21/climate/portland-emissions-infrastructure-environment.html</p>
Apr 27 5:2	Waste & Industry Assignment 2: Part 1 Due	<p>Henson, R. 2019. [Chapter 20]</p> <p>US EPA. “Greenhouse Gas Reporting Program: GHGRP Waste” https://www.epa.gov/ghgreporting/ghgrp-waste</p> <p>US EPA. Global Non-CO2 Greenhouse Gas Emission Projections & Mitigation Potential: 2015-2050. EPA-430-R-19-010. https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases [Introduction to page 10, and Waste pages 67-75]</p> <p>US EPA. Non-CO2 Greenhouse Gas Data Tool. https://cfpub.epa.gov/ghgdata/nonco2/</p> <p>Plus for Grad Students:</p> <p>Oteng-Ababio, M., et al., (2018). Urban solid waste management. In Rosenzweig, C., et al., (eds.), <i>Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network</i>. Cambridge University Press. New York. https://uccrn.ei.columbia.edu/arc3.2 [Chapter 15, pages 553–582]</p> <p>Recommended for All:</p> <p>TBD</p>
May 2 6:1	District Systems	<p>UNEP. 2015. District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy. https://www.unep.org/resources/report/district-energy-cities-unlocking-potential-energy-efficiency-and-renewable-energy [Parts 1 and 2, and recommending Part 5]</p> <p>C40. 2021. “How to decarbonize your city’s heating and cooling systems” September, 2021. https://www.c40knowledgehub.org/s/article/How-to-decarbonise-your-city-s-heating-and-cooling-systems?language=en_US</p> <p>Plus for Grad Students:</p> <p>IEA. 2019. “How can district heating help decarbonize the heat sector by 2024?” October 21, 2019. https://www.iea.org/articles/how-can-district-heating-help-decarbonise-the-heat-sector-by-2024</p> <p>Recommended for All:</p> <p>Chittum, A. “Aarhus, Denmark, in Governance Models Workshop: Journeys Through Business Models: Best Practices and Lessons Learned” Workshop: Governance Models and Success Strategies for Developing Thermal Grids. International District Energy Association, November 17, 2017. https://www.districtenergy.org/viewdocument/governance-models-workshop-journey [Download pdf slide presentation, begin from slide number 15 and end at 22] https://www.youtube.com/watch?v=0UcYsHAKWbo [Aarhus case begins at 18:00 and ends at 28:20]</p> <p>Ahern, M. “Governance Models Workshop: Community-Based Energy Planning, Financing and Business Structures” Workshop: Governance Models and Success Strategies for Developing Thermal Grids. International District Energy Association, November 17, 2017. Mission Rock Case Study: https://www.districtenergy.org/viewdocument/governance-models-workshop-communi [Download pdf slide presentation, begin from slide number 15 “District Energy at Mission Rock”] https://www.youtube.com/watch?v=snEp5Iym2Tc [This is the video of the presenter without the slides, and the Mission Rock project section goes from 23:00 to 33:00 in the video]</p>
May 4 6:2	Urban Heat Assignment 2: Part 2 Due Third Exam	<p>Henson, R. 2019. [Chapter 4]</p> <p>Degirmenci, K. et al. 2021. Understanding policy and technology responses in mitigating urban heat islands: A literature review and directions for future research. <i>Sustainable Cities and Society</i>, Volume 70, 2021, 102873, ISSN 2210-6707, https://doi.org/10.1016/j.scs.2021.102873 At UW Libraries: https://www.sciencedirect.com/science/article/pii/S2210670721001633</p> <p>Roston, E. et al., 2020. Life and death in our hot future will be shaped by today’s income inequality. Bloomberg, August 3, 2020. https://www.bloomberg.com/graphics/2020-climate-heat-inequality/</p> <p>Plus for Grad Students:</p> <p>Carleton, T.A. et al., 2020. Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits. <i>National Bureau of Economic Research</i>, Working Paper Series 27599, 2020 July. http://www.nber.org/papers/w27599</p> <p>Recommended for All:</p> <p>U.S. Environmental Protection Agency. 2008. Reducing urban heat islands: Compendium of strategies. Draft. https://www.epa.gov/heat-islands/heat-island-compendium.</p> <p>Tuholske, C., et al. (2021). Global urban population exposure to extreme heat. <i>Proceedings of the National Academy of Sciences of United States of America</i>, 118, e2024792118. https://doi.org/10.1073/pnas.2024792118</p> <p>Crownhart, C. How hot is too hot for the human body? MIT Technology Review, July 10, 2021. https://www.technologyreview.com/2021/07/10/1028172/climate-change-human-body-extreme-heat-survival/</p>

May 9 7:1	Combined Mitigation & Adaptation	<p>Boswell et al., 2019 [Chapters 6 and 7]</p> <p>Grafakos, S., et al. (2018). Integrating mitigation and adaptation: Opportunities and challenges. In Rosenzweig, C., et al., (eds.), <i>Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network</i>. Cambridge University Press. New York. https://uccrn.ei.columbia.edu/arc3.2 [Chapter 4, pages 101–138]</p> <p>Romanello et al., (2021). The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. <i>Lancet</i>, 398 (10311): 1619-1662. https://doi.org/10.1016/S0140-6736(21)01787-6</p> <p>Plus for Grad Students:</p> <p>Wagner, G., Zeckhauser, R.J. Climate policy: hard problem, soft thinking. <i>Climatic Change</i> 110, 507–521 (2012). https://rdcu.be/cLOPj</p> <p>Recommended for All:</p> <p>Miller, Sarah. “The millions of tons of carbon emissions that don’t officially exist” The New York Times, December 8, 2021. https://www.newyorker.com/news/annals-of-a-warming-planet/the-millions-of-tons-of-carbon-emissions-that-dont-officially-exist</p> <p>Kaufman, Alexander. “A ‘green’ energy project leaves a Mississippi town gasping for air” Huffington Post, December 20, 2021. https://www.huffpost.com/entry/biomass-energy-power-plants_n_61bcb6cae4b0a3722477d16a?ncid=APPLENEWS00001</p>
May 11 7:2	Flood, Drought, & Landslide Assignment 2: Part 3 Due	<p>Henson, R. 2019. [Chapter 5]</p> <p>Roop, H.A., G.S. Mauger, H. Morgan, A.K. Snover, and M. Krosby, 2020. “Shifting Snowlines and Shorelines: The Intergovernmental Panel on Climate Change’s Special Report on the Ocean and Cryosphere and Implications for Washington State.” Briefing paper prepared by the Climate Impacts Group, University of Washington, Seattle. DOI: doi.org/10.6069/KTVN-WY66. Updated 01/2020. https://cig.uw.edu/wp-content/uploads/sites/2/2020/02/CIG_SnowlinesShorelinesReport_2020.pdf</p> <p>Shi, L. Beyond flood risk reduction: How can green infrastructure advance both social justice and regional impact?. <i>Socio Ecol Pract Res</i> 2, 311–320 (2020). https://doi.org/10.1007/s42532-020-00065-0</p> <p>Plus for Grad Students:</p> <p>California Natural Resources Agency. 2021. FAQ – Updated California Climate Adaptation Strategy. https://resources.ca.gov/Initiatives/Building-Climate-Resilience/2021-State-Adaptation-Strategy-Update and to go directly to the FAQ: https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Climate-Resilience/FAQ--Updated-California-Climate-Adaptation-Strategy-4-4-2022_ada-full-version.pdf</p> <p>Recommended for All:</p> <p>TBD</p>
May 16 8:1	Sea Level Rise & Severe Storms	<p>Henson, R. 2019. [Chapters 6, 7, & 8]</p> <p>Shi, L., Varuzzo, A. M. 2020. Surging seas, rising fiscal stress: Exploring municipal fiscal vulnerability to climate change. <i>Cities</i>, 100 (2020): 102658, https://doi.org/10.1016/j.cities.2020.102658</p> <p>International Union for Concerned Scientists. 2017. When Rising Seas Hit Home. https://www.ucsusa.org/resources/when-rising-seas-hit-home</p> <p>Plus for Grad Students:</p> <p>Vogel, J., et al. 2020. Past is prologue: A case study exploration of the role of climate indicators in adaptation in the United States. <i>Climate Services</i>, 20 (2020): 100202. https://doi.org/10.1016/j.cliser.2020.100202 [esp. Broward County Case Study]</p> <p>Recommended for All:</p> <p>International Union for Concerned Scientists. 2016. Toward Climate Resilience. https://www.ucsusa.org/resources/toward-climate-resilience</p>
May 18 8:2	Wildfire Fourth Exam	<p>Kennedy, M. C., Bart, R. R., Tague, C. L., and Choate, J. S.. 2021. Does hot and dry equal more wildfire? Contrasting short- and long-term climate effects on fire in the Sierra Nevada, CA. <i>Ecosphere</i> 12(7):e03657. 10.1002/ecs2.3657</p> <p>Hickey, H. “Possible future for Western wildfires: Decade-long burst, followed by gradual decline” UW News, July 27, 2021. https://www.washington.edu/news/2021/07/27/possible-future-for-western-wildfires-decade-long-burst-followed-by-gradual-decline/</p> <p>Morgan, H.A., Bagley, A., McGill, L., Raymond, C.L. 2019. Managing Washington Wildfire Risk in a Changing Climate. Workshop summary report prepared by the Northwest Climate Adaptation Science Center and the Climate Impacts Group, University of Washington, Seattle. https://nwcasc.uw.edu/wp-content/uploads/sites/23/2019/04/Managing-Western-Washington-Wildfire-Risk-in-a-Changing-Climate-1.pdf</p> <p>Plus for Grad Students:</p> <p>D’Evelyn, S.M., Jung, J., Alvarado, E. <i>et al.</i> Wildfire, Smoke Exposure, Human Health, and Environmental Justice Need to be Integrated into Forest Restoration and Management. <i>Curr Envir Health Rpt</i> (2022). https://doi.org/10.1007/s40572-022-00355-7</p> <p>Recommended for All:</p>

		<p>Johnson, N. “Good wildfire news? Evidence from the Bootleg Fire supports thinning forests” Grist, July 26, 2021. https://grist.org/extreme-weather/wildfire-bootleg-fire-news-forests/</p> <p>Mann, Charles. “‘There’s good fire and bad fire.’ An Indigenous practice may be key to preventing wildfires” National Geographic, December 17, 2020. https://www.nationalgeographic.com/history/2020/12/good-fire-bad-fire-indigenous-practice-may-key-preventing-wildfires/</p>
May 23 9:1	Modeling Policies & Projects	<p>Whittington, Jan and Stefanie Young. “Resilience through Transaction Cost Economic Evaluation: Recognizing the Cost-Effectiveness of Sustainable Development.” <i>Surveys and Perspectives Integrating Environment and Society (S.A.P.I.E.N.S)</i>, vol. 6, no. 1, 2013. <i>OpenEdition: Ressources électroniques et communication scientifique</i>, http://sapiens.revues.org/1639</p> <p>Whittington, J. 2021. Climate-Smart Capital Investment Planning. [Excel Model downloadable from Canvas Modules]</p> <p>California Air Pollution Control Officers Association (CAPCOA). 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Final Draft, December, 2021. https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf [Chapter 1 and for the assignments and in-class exercises Chapter 3]</p> <p>California Air Pollution Control Officers Association. 2022. CalEEMod®. http://caleemod.com/</p> <p>Plus for Grad Students:</p> <p>Northwest Climate Adaptation Science Center. n.d. “The Future of the Northwest” https://uw.maps.arcgis.com/apps/Cascade/index.html?appid=0fca8dcc02e84279a2fa10a6a5f07481 [Go to Integrated Scenarios, Information and Guides: https://climate.northwestknowledge.net/IntegratedScenarios/gallery_info.php, try the Guidance Tool: https://climate.northwestknowledge.net/IntegratedScenarios/guidanceTool.php, and Click through Summary Projection Layers: https://climate.northwestknowledge.net/IntegratedScenarios/vis_summarymaps.php]</p> <p>Recommended for All:</p> <p>TBD</p>
May 25 9:2	Compounding Events & Cascading Effects	<p>Collins M., et al., 2019: Extremes, Abrupt Changes and Managing Risk. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 589–655. https://doi.org/10.1017/9781009157964.008 [Chapter 6.8 and 6.9, pages 624-632] https://www.ipcc.ch/srocc/chapter/chapter-6/</p> <p>Lenton, T.M. et al. 2019. Climate tipping points – too risky to bet against. <i>Nature</i> 575, 592-595 (2019) doi: https://doi.org/10.1038/d41586-019-03595-0</p> <p>USGCRP, 2018: <i>Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II</i> [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018. [Chapter 17: Sector Interactions, Multiple Stressors, & Complex Systems] https://nca2018.globalchange.gov/chapter/17/ [To access the full report: https://nca2018.globalchange.gov/chapter/front-matter-about/]</p> <p>Plus for Grad Students:</p> <p>Weitzman ML. Some Basic Economics of Climate Change. In: Touffut J-P Changing Climate, Changing Economy. Edward Elgar ; 2009. https://scholar.harvard.edu/files/weitzman/files/heap_discussion_10.pdf</p> <p>Recommended for All:</p> <p>TBD</p>
May 30 10:1	Ecosystems (No Class)	<p>USGCRP, 2018: <i>Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II</i> [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018. [Chapter 7: Ecosystems, Ecosystem Services, & Biodiversity] https://nca2018.globalchange.gov/chapter/7/ [To access the full report: https://nca2018.globalchange.gov/chapter/front-matter-about/]</p> <p>Plus for Grad Students:</p> <p>TBD</p> <p>Recommended for All:</p> <p>Northwest Climate Adaptation Science Center. n.d. “Actionable Science Deep Dives”. https://nwcasc.uw.edu/resources/actionable-science-deep-dives/</p>
Jun 1 10:2	City Climate Finance Fifth Exam	<p>World Bank. 2021. <i>State of Cities Climate Finance 2021 Part 2: The Enabling Conditions for Mobilizing Urban Climate Finance</i>. © World Bank. License CC BY 3.0 IGO. 93 pages. [authored by S. Boukerche, D. Mason, J. Boex, and J. Whittington] https://citiesclimatefinance.org/wp-content/uploads/2021/06/2021-State-of-Cities-Finance-Part-2.pdf [Part 3 and review 4 and 5] For the whole report: https://citiesclimatefinance.org/publications/2021-state-of-cities-climate-finance/</p> <p>Granoff, I., J Hogarth. & A Miller. “Nested barriers to low-carbon infrastructure investment.” <i>Nature Clim Change</i> 6, (2016): 1065–1071. https://doi.org/10.1038/nclimate3142</p> <p>Plus for Grad Students:</p>

TBD

Recommended for All:

TBD

Jun 6

Final Exam

No Final Exam
