

Collaborative Sustainability | PUA 792

Fall 2025

Meeting location & dates: Tuesdays, 5:30 – 8:15pm, [CHB C112](#)

SYLLABUS



INSTRUCTOR

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10:30am-12pm and by appointment

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- Data-Driven EnviroLab: <https://datadrivenlab.org/latest-insights/#>
- Climate Rising: <https://www.hbs.edu/environment/podcast/Pages/default.aspx>

Course Overview

Sustainability leadership requires harnessing myriad stakeholders, policy strategies and financial mechanisms while navigating through increasingly uncertain legal, political and environmental conditions—not least the complex physical risks of climate change. This course trains students in both the theory and applied knowledge of sustainability problems and solutions across several key areas: Energy efficiency is taught using live access to building energy analytics systems, enabling students to learn how energy conservation in modern buildings is achieved in real time. Policy writing is taught using legislation written by Professor Leffel as a template, through which students learn to write ordinances that can translate into future environmental law. Environmental injustice is taught using both readings on longstanding systems of oppression and data mapping tools to enable students to detect disproportionate pollution on vulnerable communities. Stakeholder engagement is taught using real government-led community survey results, and using real stakeholder mapping and engagement reports which Professor Leffel was commissioned to create, enabling students to formulate policy in response to constituent demand and map stakeholders to achieve sustainability goals. Renewable energy leadership is taught using comprehensive data on U.S. renewable versus fossil fuel-based power projects and materials on the political-economics of greening electricity grids. These and other subjects, including regulatory risks and managing extreme heat, empower students with both the theoretical understanding and applied skills to advance sustainability leadership across the public, private, civic or academic sectors.

Course Objectives	Course Content
<p>By the end of this course, a student who has participated fully should will understand:</p> <ol style="list-style-type: none"> 1. The various stakeholders and roles involved in achieving sustainability goals 2. Why environmental injustices occur and how to detect and remedy them 3. Crises surrounding water contamination and drought, and management of them 4. Green energy policy strategies including to achieve a more renewable-centric energy mix 5. How to detect climate misinformation and understand its sources and motivations 6. Federal, state and local environmental governance 7. How to write an ordinance 8. Applied mechanisms of energy efficiency 9. Symbiotic relationships between public and private sectors pursuant to climate goals 10. The design and deployment of effective financial incentives for sustainable goals 11. The basic components of circular economy 	<p><i>Modules</i></p> <ol style="list-style-type: none"> 1. The many stakeholders of sustainability 2. Extreme heat 3. Water contamination & drought 4. Distributional problems & environmental racism 5. Energy policy 6. Federal environmental policy 7. Misinformation 8. Public-Private Partnerships 9. State & local climate governance 10. Environmental Law 11. Financial incentives 12. Energy efficiency 13. Circular economy 14. Indigenous communities

COURSE SCHEDULE

Week 1 |The many stakeholders of sustainability

Stakeholders in sustainability range from those impacted by changing environmental conditions to those able to contribute to the improvement of those conditions. These may be individuals and organizations across government, business, nonprofits and university. How can we map the stakeholders most likely to be impacted by environmental change and who can contribute to managing that change? What are the roles and functions of these sustainability stakeholders? What do these dynamics tell us about how societies manage collective sustainability problems? Finally, how do we construct effective stakeholder engagement strategies to achieve sustainability goals? This week, we will answer these questions and will use what you have learned to create a stakeholder mapping for data center-related concerns, an exercise that will play a bigger role during your final project.

Readings

Augustin-Behravesh et al., 2025, [How stakeholder influence shapes public sector environmental policy choices, *Journal of Cleaner Production*](#)

Sterling et al., 2017, [Assessing the evidence for stakeholder engagement in biodiversity conservation, *Biological Conservation*](#)

Vogler et al., 2017, [Stakeholder Analysis in Environmental and Conservation Planning, *Lessons in Conservation \(American Museum of Natural History\)*](#)

Newig et al., 2023. [Does stakeholder participation improve environmental governance? Evidence from a meta-analysis of 305 case studies, *Global Environmental Change*](#)

Stakeholder mapping & engagement example for client

- “LV Stakeholder Mapping”: This spreadsheet was prepared by Prof. Leffel for Verizon to map stakeholders across Las Vegas relevant to achieving the firms’ community resilience goals. This

provides a deep but non-exhaustive listing of government, business, civic sector and university leaders in the region who are both impacted by changing environmental conditions and can contribute to their improvement.

- “Las Vegas Stakeholder Engagement Brief for Verizon”: This is the stakeholder engagement strategy prepared by Prof. Leffel for Verizon, which describes the major community resilience problems present in Las Vegas, identifies the communities most vulnerable to these problems, and describes strategies by which stakeholders may be engaged to improve local resilience.

Assignment: A major tech firm is in talks with the City Las Vegas and Clark County about siting a data center in North Las Vegas, near Nellis Air Force Base, but concerns have been raised as to the potential environmental impacts, particularly as they pertain to water scarcity and the potential impact on electrical utility rates. You have been tasked by the Nevada Governor’s Office of Energy to create a stakeholder mapping for Las Vegas’ government, private sector and civic sector entities relevant to the environmental impact of the data center siting. Identify at least three government stakeholders that should be party to the assessment of impacts, companies (other than the tech firm) that would have any stake in the matter, and civic organizations that may have an interest in environmental impacts. In a one-page brief, list these stakeholders and explain exactly what their stake in the siting of the data center is. Give careful thought to the social, political, financial and environmental impacts which a data center could foreseeably incur on the city, and on the interests and goals of the stakeholders.

Week 2 | Extreme Heat

What problems does extreme heat pose in our communities and what strategies exist to manage them? How and why does the urban heat island effect disproportionately effect vulnerable communities, and how does this reflect broader structural inequalities? What tools make visible the worst of these impacts? What nature-based and technological solutions to extreme heat are scalable? This week, we will answer these questions and use what we have learned to build a heat mitigation plan for the recently-passed bill AB 96 (2025), which mandates extreme heat planning but does not specify precisely how.

Readings

[City of Phoenix 2025 Heat Response Plan](#)

Alahmad et al., 2025. [A modeling study of cool surfaces and outdoor workers productivity at San Francisco International Airport](#). *PNAS Nexus*.

Hsu et al., 2021, [Disproportionate exposure to urban heat island intensity across major US cities](#). *Nature Communications*

An and Dedekorkut-Howes, 2025, [A Review of Adaptation Strategies to Increased Urban Temperatures and Heat Island Effect](#). *Discover Cities*

[Meerow and Keith, 2022. Planning for Extreme Heat: A National Survey of U.S. Planners](#). *Journal of the American Planning Association*

Mees et al., 2015. ["Cool" governance of a "hot" climate issue: public and private responsibilities for the protection of vulnerable citizens against extreme heat](#). *Regional Environmental Change*

Greg Kats, ["Creating city wide cooling systems to slow global warming"](#). *TEDxBoston*

Data tools

- [Climate Shift Index](#): For any given day and location on the planet, the Index quantifies how much more likely a day's temperature is due to human-caused climate change. A score of +5 means the temperature that day was at least 5× more likely because of climate change, 0 means no detectable attribution, and -5 means less likely due to warming. In sum, it is a real-time diagnostic of the impact of climate change on daily temperatures. The Index is calculated daily, using a methodology outlined in the peer-reviewed paper [Communicating the Links between Climate Change and Heat Waves with the Climate Shift Index](#).
- [Urban Heat Island](#) disparity explorer: The urban heat island effect occurs when an urban area is disproportionately hotter than surrounding non-urban areas due to lack of greenspace and the trapping/reflecting of heat from buildings and other infrastructure. This tool allows for side-to-side map comparison of urban heat levels and socio-demographic characteristics of areas across the United States. On the lower-left menu, select "Annual day" which will display the urban heat intensity of selected areas. Zoom to a city of interest in which there is data coverage. On the lower-middle menu, select "Median income" and visually compare how areas of certain income levels are more/less exposed to urban heat. Do the same by cycling through other variables on the right-side screen (i.e., "White population (%)", "Black population (%)", "Other population (%)").
- [Las Vegas Urban Heat Map](#): This map displays by default the Afternoon Temperature. What areas in Las Vegas appear most impacted by urban heat? Use the Add Data tool (on the top left of the map, hover your mouse over the second to far right button), then search for "ACS Median Household Income" and then click "ADD". The new mapping of income across the county will become visible. You can switch this on or off in the "Layers" window. What pattern do you notice with regard to the urban heat distribution? Experiment with other data you can add to the map; what does it tell you about the geography and demographics of urban heat?
- [LIHEAP map](#) – Heat related illnesses

Assignment: Design the heat mitigation plan for AB 96. Design the measures needed to implement: Access to public cooling spaces; Public drinking water; Cool building practices; Shade over paved surfaces; and Other mitigation measures.

Include for each measure:

- Target populations and lead (city/county) government departments
- Mark specific sites or areas on a map of Las Vegas (or several maps) of where each measure is to be implemented
- Justify site selection: Why *these* buildings/spaces/surfaces for cool building/shade/etc?
- Specify metrics and targets: How *much* is being deployed (quantity of trees/vegetation, cool roofs, shade mechanisms, cooling stations, water fountains, etc.), and why?
- Specify materials: Species of trees, types of vegetation, type/brand of albedo coating, vendor of shading area equipment, type of cooling space technology.
- Who are the stakeholders and what are their roles?

Note: In addition to your own research, use at least two existing laws from anywhere in the world to inform the language and content of the provisions you include, and cite all of your sources.

Week 3 | Water contamination & drought

How and why does water contamination and drought impact society? What regulatory frameworks exist to keep water clean and available? What major failures in the past and present stand as key signals for our progress in water management? How does drought interact with water contamination? How is climate change worsening these issues and what tools allow us to detect the major pain points? This week we will answer these questions and propose policy solutions.

Readings:

Clean water

[Summary of the Clean Water Act](#)

[Flint water crisis \(CDC.gov\)](#)

Hughes, 2021. Flint, Michigan, and the Politics of Safe Drinking Water in the United States, *Perspectives on Politics*

Grooms 2015, Enforcing the clean water act: The effect of state-level corruption on compliance, *Journal of Environmental Economics and Management*.

Brelsford and Abbott, 2017. [Growing into Water Conservation? Decomposing the Drivers of Reduced Water Consumption in Las Vegas, NV. *Ecological Economics*](#)

Davis, 2012. [Lessons Unlearned: The Legal and Policy Legacy of the BP Deepwater Horizon Spill. *Washington and Lee Journal of Energy, Climate, and the Environment*](#)

Garcia, 2025, ["I served on the Deepwater Horizon inquiry commission. Trump has us headed for a new disaster." *The Guardian*](#)

Colorado River Basin

[Colorado River Basin Interim Guidelines. *Western Resource Advocates*](#)

["Post-2026 Colorado River Reservoir Operational Strategies for Lake Powell and Lake Mead Narrative of National Environmental Policy Act Alternatives," *U.S. Department of the Interior*](#)

Benson, 2025, [Interior renews agreements in hope of strengthening Colorado River conservation efforts. *UPI*](#)

Data tools/exercises

Data Exercises

- *Water contamination:*
 - Data tool: EPA ECHO Comparative Map for Wastewater: Find the *best versus worst wastewater conditions—what violations of the Clean Water Act and Safe Drinking Water Act are common and why?*
- *Drought*
 - [U.S. Drought Monitor Map \(Current conditions\)](#): This map visualizes the most recent drought conditions across the U.S., measured across the following scale of severity: D0 = Abnormally Dry; and D1-D4 = Moderate, Severe, Extreme and Exceptional Drought, respectively. Click on an area to zoom in as far as the county-level for details on drought conditions.
 - [U.S. Drought Monitor Time Series](#): This time series page allows you to select a state and to visualize the percent area of land that is in drought conditions, ranging from D0 to D4. Note that hovering your mouse over any area of the chart automatically displays the drought (D0-D4) percentage values of that time period. Select a state of interest and observe the trends.
 - [U.S. Drought Monitor State Impacts](#): This tool allows you to see media coverage of drought-related conditions in specific states, including by the number of weeks into a drought a state was and the specific "impact sectors" in which news media reports specific drought-related impacts for that state (such as "Agriculture", "Fire", "Plants & Wildlife" and/or "Water Supply & Quality"). Choose a state, select an impact sector of interest, and read the headlines. Also sort the "Weeks in Drought"

column to show the headlines from the most weeks into a drought the state was. Observe general patterns of how droughts impact different sectors in a state.

Assignment: You have been tasked by the Department of Interior and EPA to investigate whether a relationship exists between drought-stricken areas and water law compliance. Identify areas stricken with the most severe levels of drought using the U.S. Drought Monitor. Then use the ECHO database to identify instances of violations of the Clean Water Act, Safe Drinking Water Act or other water-related regulations. What do cases you find indicate? What is the nature of violations—are they tied to drought conditions? Propose a policy solution to and problems you find.

Week 4 | Distributional problem & environmental racism

Distributional problems are a built-in challenge of environmental governance, where harms from environmental problems and benefits from the remedy of those problems are unequally distributed. How and why are minority and other vulnerable populations disproportionately affected by environmental harms? Is this a feature or a bug of environmental governance? What is environmental racism, and how do systems of oppression perpetuate it? What role do legal, political and economic power structures play in these distributional problems? This week, we will answer these questions, use mapping tools to identify where and how injustices occur and propose solutions. We will then use what we have learned analyze the risk of further injustices posed by the “One Big Beautiful Bill Act”.

Readings

Logan, 2018, Liberty and Environmental Justice for All: An Empirical Approach to Environmental Racism, *Wake Forest Law Review*

Gherghina, Dokshin and Leffel, 2025, [Unequal solar photovoltaic performance by race and income partly reflects financing models and installer choices](#), *Nature Energy*

[“How Decades of Racist Housing Policy Left Neighborhoods Sweltering”](#), *The New York Times*

Video material:

[“Environmental Racism: Mapping tools to detect it”](#) (YouTube, Dr. Ben Leffel)

Data Tools:

EPA Environmental Justice Screening tool: (1) [EJ screen tool \(clone\)](#):. This tool is a clone of the original EPA EJ screen tool, as the official version is blocked (see next bullet point for details). This tool enables visualization of local-level environmental injustices. Use the map to zoom into a city of your choosing. Then use the top-left menu to select "Environmental Burden Indicators", and choose different indicators to show the geographic distribution of different forms of environmental pollution or hazards. Then select "Socioeconomic indicators" in the menu, and select different items (particularly People of Color and Low Income). Toggle back and forth between the Environmental and the Socioeconomic indicators. What patterns do you see? Further, you can select the menu item "Environmental Justice Indexes", which will display areas for which the combined environmental burden and social vulnerability are higher, based on specific indicators (i.e., the Particulate Matter 2.5 item under the Environmental Justice Indexes will show the areas where more socially vulnerable populations--people of color, low income, etc.--are more exposed to Particulate Matter 2.5). Try to find "smoking gun" tracts--ones that have high Environmental Justice Indexes for specific environmental indicators, and that also have overlapping Environmental Burdens and Socioeconomic indicators. How does

- **Assignment:**

the geographic distribution of certain Environmental Justice Indexes compare to your manual toggling between Environmental Burden and Socioeconomic indicators?

- **Note: The original [EJScreen comparemapper tool \(epa.gov\)](#) featured a side-by-side mapping comparison tool enabling greater ease for visually comparing environmental and demographic patterns, however, public access to this tool has been blocked by the Trump administration as of early Feb 2025. In the next U.S. administration, the tool in its original form will hopefully be restored, at which point, the following exercise using the comparemapper can be used:** This tool allows for side-to-side comparison of maps based on environmental and socio-demographic characteristics of areas across the United States. Zoom to any location of interest in the United States. On the upper-left side of the screen, click the “Map Data” dropdown menu and under the Category menu, select “Pollution and Sources”, and under the Variable menu, select categories such as “Hazardous Waste Proximity” or “Air Toxics Respiratory” (or others, explore!). On the center-top of the screen, click the other Map Data dropdown menu (which corresponds to the right-side map), and under the category menu, select “Population”, and under the variable menu, select “Pct. People of Color Population” (or alternatively, Pct. White, Pct. Hispanic, etc.). You may also want to separately select the category of “Income/Poverty” and the variable “Pct. Population below poverty level”. What patterns do you observe in terms of overlap between certain environmental hazards and certain racial (or economic) demographics?

(2) [EPA CEJST \(clone\)](#):. This tool is a clone of the original EPA Climate and Economic Justice Screening Tool, which has been blocked (see next bullet point for details). This tool maps disadvantaged communities across the US, displaying these communities as individual census tracts of highlighted in light blue. and provides rankings on severity of environmental and social issues across several categories. Zoom into the city you observed in the previous exercise (with EJScreen), and click on the same tracts you identified as "smoking gun" tracts. Use the Climate Change, Energy, Health and Housing tabs--what percentiles across these categories do the tract(s) fall into, if any? What does this tell you? Follow the same prompt as #1 above.

- **Note: Public access to the [Original EPA CEJST site](#). has been blocked by the Trump administration as of early Feb 2025, In the next U.S. administration, the tool in its original form will hopefully be restored.**

Assignment: The Nevada Division of Environmental Protection (NDEP) is concerned about the provision in the “Big Beautiful Bill” that allows the sale of BLM lands. NDEP wants to know whether these proposed sites are existing areas of environmental injustices, and in any case, what the demographics of these areas are (race, income level). If there are environmental injustices, what has been done about it, and what stakeholder groups should NDEP be aware of for future (collaborative) reference? If no detectable injustices, what stakeholder groups in any case exist in these areas that NDEP may be in contact with should land sales occur and environmental risks become realized? Produce a brief (max 2 pages, leaving room for maps) report using the tools described covered this week to answer these questions. Include visualizations.

Week 5 | Energy policy

Whenever you flip the light switch on, you should think to yourself, “How much of this is powered by fossil fuels?” Power generation is a leading source of greenhouse gas emissions driving climate change, and thus achieving a “green energy mix”—or energy generation powered by more renewable sources than fossil fuel sources—is a core sustainability goal for fighting climate change. How do societies undergo clean (or green) energy transitions? What is the state of American renewable (versus fossil) energy generation? What regulatory strategies prove most effective at driving the energy transition? This week, we will answer these questions and measure the “electricity mix” of locations across the U.S., understand progress and obstacles

Assignment:

toward more renewables, and use comprehensive data on renewable versus fossil fuel power projects in the U.S. to chart pathways to expand renewable power in key communities.

Readings

Bird et al., 2025, [State of the US Clean Energy Transition: Recent Progress, and What Comes Next](#), *World Resources Institute*

Thomas, 2025. [The State of Clean Energy Deployment in 2025 Tracking America's clean energy progress](#), *Cleanview*

Barbose, 2023, [U.S. State Renewables Portfolio & Clean Electricity Standards: 2023 Status Update](#), *Lawrence Berkeley National Laboratory*

Lips, 2023, [Do RPS policies still matter?](#) *DSIRE Insight*

Lawson, 2018, [Decarbonizing U.S. Power](#), Center for Climate and Energy Solutions

Data exercises:

- [Electricity mix](#): In both the section “Share of electricity production by source” and “Share of electricity generation from fossil fuels, renewables and nuclear,” click “Edit countries and regions”, clear selections then select United States. Which specific renewable energy sources are driving the most progress in overall U.S. renewable energy transition?
- EIA State energy profiles: In EIA’s [Nevada energy profile](#), scroll to the bottom of the page and click the “Electricity” tab. Do the same for [California's energy profile](#). What are the major differences in renewable versus non-renewables?

Assignment: The Department of Energy is interested in whether states with more renewable energy capacity built within their jurisdictions have comparatively greener energy mixes, or if states are simply exporting renewable generation to other states. Answer this question by using the dataset “All Power Plants in the US _ Cleanview_CLASS VERSION”, which represents all current power plants in the U.S. by megawatt (MW) capacity and technology type—including renewable and non-renewable—which has been provided by Cleanview exclusively for use in our class, and is not to be shared outside of the classroom. Calculate the (1) total renewable versus non-renewable energy capacity (MW) by state and year, and then (2) for each state-year, the amount of renewable capacity as a percentage of overall capacity. Next, choose at least five states, and calculate the green energy mix (amount of electricity generation by renewables as a percentage of total generation) for those states for years that overlap your Cleanview data. Are states with more renewable energy capacity also have comparatively greener energy mixes? Present results using data visualizations (bar/line graphs or others as you see fit). Conduct background research on your selected states to further explain patterns you are finding.

Week 6 | Federal environmental policy

Federal environmental policy can yield major positive (Inflation Reduction Act, 2022) and negative (One Big Beautiful Bill Act, 2025) impacts on sustainability leadership, driven by very different priorities on energy governance. What competing philosophies are articulated through the Inflation Reduction Act (2022) versus One Big Beautiful Bill Act (2025)? What opportunities and obstacles did these pieces of legislation create, and for whom? What is real ‘Energy Dominance’ and what definition of it serves long-term sustainability needs?

This week, we will answer these questions and use what we have learned to estimate the impacts of the Big Beautiful Bill.

Readings

[Inflation Reduction Act](#) (2022)

Anderson et al., 2025 [The One Big Beautiful Bill Act: Comprehensive Holland & Knight Analysis](#) (see section “Energy Policy and Environmental Regulations”).

Thomas, 2025, [Congress’ Mega-Bill Puts 600 GW of Clean Energy Capacity at Risk](#), *Cleanview*

Murray, 2025, [The Energy Dominance Our Economy Actually Needs](#), *The National Interest*

Thombs et al., 2025, [Reducing U.S. military spending could lead to substantial decreases in energy consumption](#), *PLOS Climate*

Turner, 2025, [The One Big Beautiful Bill Act: Considerations for Cities and Community Partners](#), *Climate Law: A Sabin Center blog*

Data tool:

[Rapid Energy Policy Evaluation and Analysis Toolkit \(REPEAT\) – “Impacts of the One Big Beautiful Bill on the US energy transition”](#). Explore these tabs and observe the OBBBA trajectories versus other scenarios, what major changes do they indicate, and what does this mean for near-future sustainability leadership?

- GHG emissions
- Sectoral GHG emissions
- Light duty vehicle sales (EV sales)
- Annual electricity consumption
- New capacity comparison
- Electricity GHG emissions

Assignment: Cross-reference the [Big Beautiful Bill text](#) with the Cleanview data on renewable energy projects. Which state will be most impacted? Describe the impacts, and also put a dollar value on the impacts, in terms of energy savings lost, or other positive financial aspects of renewable energy projects to be lost.

Week 7 | Misinformation

While the digital age affords us with access to exponentially greater sources of information than past generations, paradoxically the truth can become more difficult to reach. This becomes markedly worse when strong efforts exist to deliberately disseminate inaccurate information. Such is the case with information on the realities of human-caused climate change—despite overwhelming scientific consensus, vast efforts to disseminate misinformation exist, sowing doubt and confusion. Misinformation can be motivated by fossil fuel and other monied interests, or by hapless ignorance, and the result is a small but often powerful portion of the population denying human-induced climate change is occurring. What are the major sources of climate denialism and misinformation? What geography does denialism follow, and what are the political and economic drivers? Is there a typology of climate denialism? What practical impacts does climate misinformation have? How do we spot climate misinformation? How do we fight climate denialism? This week we will answer these questions and use what we have learned to spot new climate misinformation, discern how it could negatively influence policymaking and determine strategies to fight the misinformation.

Readings:

Climate opinion

Dowell and Lyon, 2024. [Beliefs Matter: Local Climate Concerns and Industrial Greenhouse Gas Emissions in the United States](#), *Journal of Business Ethics*

Gounaridis and Newell, 2024, [The social anatomy of climate change denial in the United States](#), *Scientific Reports*

Leffel, 2024. [IN RESPONSE: Ending fossil fuel use only way to move forward](#), *Las Vegas Review-Journal*

Halaly, 2025. [‘Not going to give charlatans a platform’: UNLV professor won’t back down on climate change](#), *Las Vegas Review-Journal*

Bloomberg, 2025, [The Texas Floods Were Made Worse by Climate Denialism](#), *Bloomberg*

Examples of climate misinformation

Christy, 2021, [A practical guide to climate change in Alabama](#)

Christy et al., 2025. [A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate](#), *U.S. Department of Energy*

Data tools:

- [Yale Climate Opinion Map](#): This tool maps county-level beliefs on the severity of climate change and related opinions. Is there a geography of climate belief in the U.S.? What social, political and/or economic factors explain it?
- [Hot Air Tool: This tool provides a typology of climate misinformation by category \(i.e., tropes like “but CO2 is plant food”, and the like\) and draws directly on the sources of the misinformation, by author and source, and across written \(News, X/Twitter\) and video-based \(YouTube\) platforms. What are the most common sources of climate misinformation? Which ideas and tropes are most popular?](#)

Assignment: Find an example of climate misinformation, locally or nationally, that is intended to influence policy. This can be part of a corporate lobbying effort, a policy report from a partisan think tank, or another form of influence. Explain: (1) Why it is misinformation; (2) how could it influence policy—be specific, name standing legislation or in-process legislation it could be targeting; (3) What strategies could be used to reduce this undue influence on policymaking?

Week 8 | Public-Private Partnerships

Symbiotic relationships form among public (government) and private (business) sector entities when their respective sustainability goals overlap, or in any case if partnership serves their respective interests. This is true also for climate policy: Cities are the leading territorial source of greenhouse gas emissions driving climate change, and corporations are the leading organizational source. Both increasingly pursue their own respective climate mitigation efforts, and since cities and corporations are heavily co-located (i.e., major businesses are housed within major cities), they are increasingly forming public-private partnerships to mutually advance those goals locally. Does this represent a convergence of urban and corporate sustainability? How do these partnerships articulate themselves, and what are emergent models? What lessons does this offer for stakeholder engagement? How are cities and businesses materially able to advance

their respective climate goals? Can such efforts help fill the national emissions gap? This week we will answer these questions and use what we have learned to formulate a novel public-private partnership to accelerate sustainability progress at a local-level.

Readings:

Kılış et al., 2025. [City-company collaboration towards aligned science-based target setting](#). *Nature Sustainability*

Buso and Stenger, 2018. [Public-private partnerships as a policy response to climate change](#). *Energy Policy*

Spraul and Thaler, 2020. [Partnering for good? An analysis of how to achieve sustainability-related outcomes in public-private partnerships](#). *Business Research*

Michal et al., 2015, [Boston Green Ribbon Commission Real Estate Working Group Report](#)

Prof. Leffel TEDx talk (forthcoming)

Assignment: Choose a major city other than Las Vegas. Identify the headquarters locations of at least two major firms that are engaged in climate action (i.e., publicly disclose sustainability reports with carbon targets, and the like). Ensure the city also has a climate action plan. Read the corporate sustainability reports of those companies and identify whether there are locally-specific initiatives being put in place, and if not, gain an understanding of what sustainability goals the company has (as these goals may extend to the local level, or wherever the firm has facilities). Similarly, read the city climate action plan to identify strategic needs of the plan. Identify potential strategic overlap between them in terms of certain goals. In 2 pages, propose public-private partnerships between the city and firms, either together or separate (whichever makes the most sense, you have creative freedom here), specifying overlapping goals, and collaborative means by which both parties (city and business) will achieve those goals. That is, exchange of technical or personnel resources? Financial investment? Be specific. Articulate specific targets (dollars saved or invested, tons of GHGs reduced or waste averted, liters of water saved, etc.) with specific years.

Required: Include screenshots of the climate action plan (or equivalent) of the city and the sustainability reports of the companies indicating the location of the company in the city of interest. Failure to include screenshots will result in lower grade.

Week 9 | Energy efficiency

What digital tools are used in achieving environmental and energy efficiency goals? How do leaders measure physical, economic and social risks associated with climate change, and how do these measurements translate into decisions? How do we track energy efficiency at the building level, how is energy waste detected, and how is this information translated into strategies to conserve energy? This week we will real-world use tools, including UC Irvine's building energy analytics system (SkySpark), to see how energy efficiency decisions are made.

- Guest speakers: Jian Peng and Stephen Bourne of AtkinsRéalis, "Digital Twin Tool"
- Accompanying reading: [Integration of an energy management tool and digital twin for coordination and control of multi-vector smart energy systems](#)

Other readings:

- Kathryn Cleary and Karen Palmer, 2020. "[Energy Efficiency 101](#)," *Resources for the Future*.
- Pine, Tom, 2018. "Reines Hall - MBCx Final Report - v2," Altura Associates, Inc.

Videos:

- [Leffel, 2023, How energy efficiency actually works \(YouTube\)](#)
- [Better Climate Challenge Road Show: Whirlpool_ \(YouTube\)](#)

Exercise: Live energy efficiency (analytics) demonstration (via Skyspark—materials in module).

In the video "How energy efficiency actually works" Professor Leffel accessed UCI's SkySpark system, the system used to track building energy analytics. UCI Facilities have granted Professor Leffel special permission to allow students to access the same data, so you can experience what building energy tracking and efficiency improvements look like. Follow these instructions. First, read about the "Energy Conservation Measures (ECMs)" in the "Reines Hall - MBCx Final Report" reading. On page 6, it notes "2.2.9 ECM-9: Zone Motion Occ Sensors: Zone motion occupancy sensors are too sensitive, which causes zones to become occupied sporadically during unoccupied periods. This induces heating and cooling loads during times when zones are not occupied. The sensitivity and timeout periods should be changed to eliminate this issue." Let's zoom in to the actual energy data during that time to see how they identified and managed this problem.

- Go to **SkySpark**
- Enter the username and password below
 - username: [REDACTED]
 - password: [REDACTED]
- In SkySpark, choose "Historian". Select Jan-2017 (select the "month" to highlight the whole month)
- "Select" > Site > Reines Hall > Floor 03 - Physics > 3111A, 3111B OFFICES > SAV-P320 > htg load (ensure you actually click "SAV-P320" to bring out the drop-down menu, as *that's* where the proper "htg load" button is found)
- "Select" > Site > Reines Hall > Floor 03 - Physics > 3111A, 3111B OFFICES > SAV-P320 > occ eff status

Do you see the same energy efficiency picture as in the video? Notice how less energy is being used because the room occupancy sensors (bottom) were originally too sensitive and were false triggering, which was causing the local controls to cycle from heating to cooling, inducing a significant amount of unnecessary heating and cooling load (top). Engineers then tuned those occupancy sensors, causing less false triggering and thus less energy use. This can be seen on Sat 7th, where bottom stops triggering and top shows less energy use.

Assignment: Observe the energy analytics from the other building which we have access to, ALP (Anteater Learning Pavilion). To view this, look it up on SkySpark as follows.

- Click "Historian"
- Choose the time period as Month of Jan 2020
- Site > ALP > Mechanical Equipment > AHU-4 > ALP AHU-4 supply fan vfd motor speed cmd

Notice what happens after Jan 24th.

- Site > ALP > Metering > Whole Site Electrical Meter > total elect power (calculated)
- Site > ALP > Metering > HTW BTU Meter > hhw htg load

Compare the pre-Jan 24th heating loads to post. What do you think happened here?

Assignment:

Occupants of the Anteater Learning Pavilion Auditorium complained of high humidity, and other potential energy inefficiencies were suspected in early June 2024. In SkySpark, choose "Historian". Select "Week", then navigate to the week of 9-Jun-2024, which will highlight that whole week.

"Select" > Site > ALP > Mechanical Equipment > AHU-1, then upon clicking the dropdown menu for AHU-1, double click the following items: "osa co2 concentration", "run status (calc)", "supply air flow", and "supply air humidity".

How is this and other potential energy inefficiencies represented here? Supply air flow represents the cubic feet per minute of air being supplied from the outside-in to the auditorium, the co2 concentration represents the parts per million of carbon dioxide present in the room (from occupants breathing), run status represents whether the systems associated with that unit are on a set operating schedule, and supply air humidity represents the relative humidity of the room. Hollow dots represent the start and end points of data gathering. Now compare the week of 9-Jun-2024 to 17-Nov-2024. What changed, and how does it translate to energy efficiency changes? Include each of the metrics in your response. *Note: Screenshots of the before and after screens are required.*

Week 10 | Environmental Law

Writing policy is not just for lawmakers, it is a crucial technical skill for citizens who have a stake in the future of their society. How do you write policy? How is policy written in a manner that targets specific environmental needs, and what are the major components? How and why are violators punished, and what political obstacles slow enforcement of environmental law? How do we detect when significant violations are occurring? What lessons does this hold for how we create rules for maintaining healthy environmental conditions? This week, we will answer these questions and use what we have learned to identify areas of frequent violation of environmental law in the U.S. and write our own ordinance to remedy that problem.

Readings

Brehm and Hamilton, 1996. Noncompliance in Environmental Reporting: Are Violators Ignorant, or Evasive, of the Law? *American Journal of Political Science*

Lynch, 2023. [Does the Concentration of the Treadmill of Production Predict US EPA Environmental Violations Across States?](#) *Critical Criminology*

Benami et al., 2020. [Innovations for environmental compliance: emerging evidence and opportunities.](#) *Stanford Institute for Economic Policy Research*

Turner, 2024. [Seattle, King County & Nonprofits Challenge Washington's Ballot Initiative Preempting Local Efforts to Phase Out Natural Gas.](#) *Climate Law: A Sabin Center blog*

Policy writing materials

- ***Ordinances passed into law***
 - **Albany Natural Gas Ban (2016)**
 - **Fairfax Natural Gas Ban (2021)**
 - **Oakland Natural Gas Ban (2020)**
 - **San Francisco Natural Gas Ban (2020)**
- ***Draft ordinance***

- **Irvine Natural Gas Ban Ordinance (2021): This draft ordinance was written by Professor Leffel while serving the Irvine City Council on climate policy.**

Data exercise

- EPA ECHO Enforcement Case Search: Under “Facility Locations” select any “State” you like, and under “Case Attributes” select “Clean Water Act” (and/or “Safe Drinking Water Act”), then on the right of the screen, select “Search”. Using the double-sided arrow button that appears on the right side of each column name, sort the column “Cases with Federal Penalty” to list locations with the highest number of such cases. Click the rows with the highest counts, which will zoom into the individual facility.

Assignment: Writing an ordinance to correct violations: Use the EPA ECHO tool to identify a cluster of environmental law violations (any law identifiable in ECHO, be it Clean Air Act, Clean Water Act, or any others) geographically concentrated within a city or county. Is there a series of violations of the same sort (i.e., water contamination as evidenced by violations of the Clean Drinking Water Act) that occur in the same area? Investigate. Read carefully through the ECHO output—what was the nature of the violation? Who is responsible? Is there a history of repeat violations and fines? After carefully reviewing the violations, write an ordinance to correct the problem at the scale you observe (city, county, village, etc.). Consider what new requirements would remedy the problem, and who should be targeted? Who should be exempt? How are violators to be punished? Do fines imposed match the cost of doing business? Be sure to craft your ordinance based on example ordinances you find from other comparable local governments, and cite your sources.

Week 11 | Financial incentives

The carrot or the stick? Incentives or hard regulations? Balancing financial incentives with strict regulations has long been a skilled practice in environmental policymaking. Financial incentives in particular have the potential to reduce the costs of regulatory compliance and to accelerate a range of pro-environmental actions by governments, businesses and individuals. What are the limits of financial incentives? What government or market failures do they correct? What role do incentives play in enabling or constraining competition or innovation? What environmental incentives are effective and how do we know? How do we design a financial incentive program? This week, we will answer these questions and use what we have learned to design a financial incentive program targeting real needs pursuant to sustainability goals.

Readings

Gillingham et al., 2009. [“Energy Efficiency Economics and Policy,”](#) *The Annual Review of Resource Economics*

Meckling et al., 2017. [“Policy sequencing toward decarbonization,”](#) *Nature Energy*

Datta and Gulati, “Utility rebates for ENERGY STAR appliances: Are they effective?,” *Journal of Environmental Economics and Management*, vol. 68, no. 3, pp. 480–506, Nov. 2014, doi: [10.1016/j.jeem.2014.09.003](#).

Leffel, Lyon & Newell, 2024. [Filling the Climate Governance Gap: Do Corporate Decarbonization Initiatives Matter as Much as State and Local Government Policy?](#) *Energy Research & Social Science*

Leffel, 2025. [Regulatory Strategies for Decarbonizing Urban and Corporate America.](#) *The Regulatory Review*

Data Exercise: Using the DSIRE database, answer the following questions: What financial incentives for energy efficiency are available in Nevada? Does the state and local governments offer residents, businesses and others ample access to cost-reducing incentives to aid in their sustainability journey? How does this compare to other states, and what does this tell you about how seriously sustainability is taken locally? There are two methods by

which you can navigate individual incentive programs. The first is to do to the [DSIRE programs page](#), click Apply Filter, then click “Categories” and highlight “Financial Incentives”, then clicking “Apply Filters” (Note: If you want to specify a particular incentive program, you can add another filter for a specific program type under the “Program Type” option). This will produce a filtered list of all financial incentive programs, which you can navigate as individual webpages on DSIRE, and which offers further links to the official local government incentive program websites. A second method of navigating financial incentives is to go to the DSIRE database [download site](#) download the “zip” file under the heading “XML/CSV Data Endpoint”, then open the file named “program”, which contains all the raw data of state renewable energy policy and incentives from the DSIRE database. The “Name” column (column I) indicates the individual program name, and the “summary” column (column U) contains details on the program itself. Filter the column “program_category_id” (column E) to include only the value “1”, which represents Financial Incentives (whereas 2 = regulations). Look across the programs by name and particularly the details in “summary”.

Assignment: Create an incentive program that promotes energy efficiency at any scale (i.e., city, county, state) below national-level. It can be a tax credit, grant, rebate, PACE program or any other category. Justify the creation of the incentive as a clear and present need within the jurisdiction, and note how the availability of the incentive will be in furtherance of the local sustainability goals. Draw on examples from the DSIRE database exercise, including exploring the official websites, to formulate your incentive program. Who is eligible and who is not? What guarantees or assurances should be put in place to ensure that this investment will yield a return on tax dollars? What are the financial parameters on the incentive (i.e. loan maximums, rebate amounts) and why?

Week 12 | State & local climate governance

The majority of the world’s population lives within cities, which are also the source of over 76% of the world’s greenhouse gas emissions. Cities have been developing climate action plans for over 30 decades, and state governments similarly have played a crucial regulatory role, producing a novel set of subnational climate governance practices. What are the key components of local GHG emissions inventorying? What sectors within locales are assessed for their carbon footprint? What equity and justice considerations are included in these plans? What are key economic dynamics that leaders must consider when designing these plans? What kind of benchmarking and certification mechanisms are used, and why? Where do leaders obtain the knowledge to execute these plans, and what global systems are being built to support urban climate governance needs? This week, we will answer these questions and use real responses from a local government sustainability survey to community members to synthesize community priorities on renewable energy and electrification.

Readings

- Matisoff and Edwards, 2014. Kindred spirits or intergovernmental competition? The innovation and diffusion of energy policies in the American states (1990–2008), *Environmental Politics*
- Sharp et al., 2011. Understanding Local Adoption and Implementation of Climate Change Mitigation Policy, *Urban Affairs Review*
- Leffel, 2022. Climate consultants and complementarity: Local procurement, green industry and decarbonization in Australia, Singapore, and the United States, *Energy Research & Social Science*
- Climate action planning documents
 - [Portland Climate Action Plan \(2015\)](#)
 - [Clark County All-In Sustainability and Climate Action Plan](#)
 - [Las Vegas 2050 Master Plan](#)
 - [Greenhouse Gas Pathways Analysis](#)
 - [Southern Nevada municipalities team up on climate](#)

Survey data: The file “Survey data” represents raw results for a community survey deployed by the Clark County government—with personal identifying information redacted—to assess local attitudes about energy efficiency, renewable energy and climate change. This will be used to complete the assignment for this week.

Assignment: The County Government Environmental Division has surveyed the community on several questions, for which both question and answer are shown in the file “Survey data”. The questions were intended to ascertain a range of public inputs: Public opinion on which areas of sustainable development are most important, what obstacles residents face in accessing renewable energy, support needed for improving access to renewables as well as to electrification, existing energy efficiency efforts, priorities for a renewable grid, and willingness to pay (by price) for renewable energy. The purpose of the survey is to guide pathways forward for the county’s renewable energy and electrification goals.

First, for each question, create a corresponding data visualization that summarizes the breakdown of responses, in whatever way you see appropriate. This will involve some general textual analysis and creation of categories.

Second, based on a synthesis of survey results make recommendations on new mechanisms (programs, finance, or other means) to be implemented by the County to enable access (overcome barriers) by residents and businesses to renewable energy and electrification. Be sure to justify these based not only on the survey results for barriers and needed areas of support, but also based on what residents said were their priorities for renewable energy and which areas of sustainable development they indicated were most relevant. *Note: See class powerpoint for formatting example.*

Week 13 | Circular economy

Can we build a zero-waste society? This is the charge of circular economy principles, which endeavors to maximize reuse of materials, recycling (combining waste with raw materials to create a new product) and recovery (using waste to make a new product). This week we will learn about how societies have reduced waste and enabled re-use of clothing, built housing designed to be fully disassembled, and integrated recycling into a manufacturing-based business model.

Guest speaker: Kris Hartley, Assistant Professor, Arizona State University

Readings:

Ellen MacArthur Foundation, [The #WearNext campaign: New York City](#)
State of Green, [Denmark's first circular social housing project](#)

Patagonia (Archana Ram), [Our Quest for Circularity](#)

Sebastien Bourdin and Nicolas Jacquet, 2025, "[Closing the loop at the local scale: Investigating the drivers of and barriers to the implementation of the circular economy in cities and regions.](#)" *Ecological Economics*

Week 14 | Thanksgiving break – No class

Week 15 | Indigenous communities

Indigenous communities, the original inhabitants of what we now call the United States, have long been subject to a range of injustices at the hands of the U.S. government and business interests. How do environmental injustices befall Indigenous communities, and who are the culprits? How does this reflect an ongoing colonial legacy, and what does it tell us about systems of oppression? Under what conditions do Tribes succeed in defending themselves against environmental injustices? What are the limits of justice? What major gaps exist today in Tribal environmental needs? This week we will answer these questions and use what we have learned to estimate various risks posed by recent regulation to Indigenous communities.

Readings:

[Human Rights Watch. "The Land of Our People, Forever": United States Human Rights Violations against the Numu/Nuwu and Newe in the Rush for Lithium](#)

Nilles, 2014. [Moapa Paiutes and Sierra Club Help Retire One of Nation's Dirtiest Coal Plants](#)

Fernández-Llamazares et al., 2020. A State-of-the-Art Review of Indigenous Peoples and Environmental Pollution, *Integrated Environmental Assessment and Management*

Maffia, "If I Sign, They'll Mine": A Comparison Between Differing Native American Perspectives on Energy Extraction," *Environmental Justice History In America*

David-Chavez et al., 2018. A Global Assessment of Indigenous Community Engagement in Climate Research, *Environmental Research Letters*

2022 National Tribal Air Association (NTAA) Needs Assessment

2024 State of Tribal Air Report

Data exercise:

EPA FLIGHT: This tool displays the greenhouse gas emissions of large facilities across the United States, and allows you to specify a variety of variables to add to the map, including Tribal territories. When viewing the map page, select the “Browse to a State” dropdown menu and select “Nevada”, then click the “APPLY SEARCH” button on the top-right. Then on the map, under the “Display Facilities” buttons that will appear, select “Relative to Emissions”, which will display the Nevada polluting facilities by dots, for which the dot size is proportional to the amount which they are polluting. Now again click the “Browse to a State” dropdown menu and select “Tribal Land”, and click “APPLY SEARCH”. This will display the polluting facilities that overlap with Tribal territories. What state stands out? One particular state that houses numerous Indigenous territories will appear highly populated with high-polluting facilities. Zoom into these facilities. Are they tribally owned?

Assignment: The Bureau of Indian Affairs has tasked you with (1) identifying the risks posed to Tribes from the One Big Beautiful Bill Act (OBBBA); (2) identifying which Tribes will have the greatest exposure to that risk, and (3) what potential dangers they may face. 2 pages maximum. “Risks” are broadly defined, and include but are not limited to: Environmental and health risks posed by lack of access to (previously-available) grant funding, self-governance related challenges or economic burdens.

Week 16 | Final

The environmental impacts of expanding computing needs, driven in no small part by usage of artificial intelligence tools, represent a major current sustainability challenge. This prominently takes the form of siting data centers that supply this computing demand, and these centers often place substantial energy and water demand on the locales where they are built. It is important, then, to assess the environmental, economic and social impacts of a siting decision, and how this information translates to the risks and opportunities associated with siting. Your final project involves developing just such a review, which can inform the conditional logic on which a siting decision can be made.

Readings

[“Texas AI centers guzzle 463 million gallons, now residents are asked to cut back on showers”](#) *The Economic Times*

[“Repurposing Coal Assets for a Decarbonized Digital Economy.”](#) Lawrence Berkeley National Laboratory, Section 4.6 “Factors affecting data center expansion into coal communities”, pages 51-62 and Section 5 “Government Incentives, Policies, and Programs”, 63-69.

Norris et al., 2025. [Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems](#), *Nicholas Institute for Energy, Environment & Sustainability*

Data center ordinances

[Chandler, AZ Data Center Ordinance \(2022\)](#)

[Phoenix, AZ Zoning Ordinance Amendment for Data Centers \(2025\)](#)

Final project: You are being tasked by a city government (of your choosing, but other than Las Vegas) to create a strategy that can help the government inform a decision on siting a large data center, for which the projected energy demand is 300 MW and the water demand is 300 million gallons annually. The strategy includes stakeholder mapping and engagement—which assists in identifying and collaborating with relevant parties—as well as review of regulatory, environmental and economic conditions, which assists in identifying

the risks and opportunities associated with the decision. The brief must be between 5-10 pages and include the following:

- Environmental risks & hazards:
 - *Existing*: List all environmental (including climate change-related) risks, including but not limited to: Drought, pollution (air or waterborne), biodiversity. Illustrate how these risks translate to real impacts.
 - *Projected*: Describe the new environmental risks that may be posed by siting a data center, including water demand impacts and additional pollution.
- Energy supply and demand: Can the existing grid supply the new energy needs of the data center?
- Vulnerable communities: Map which communities are vulnerable by use of any methods available, but ensure that an actual mapping is produced. This includes water-related concerns, disproportionate exposure to heat or pollution, health risks or other risks. How might siting a data center exacerbate existing environmental inequality in the city?
- Environmental goals & projects: Describe existing environmental goals, such as a climate action plan or equivalent initiative in place in the jurisdiction, and explain (a) whether siting the data center would contravene these plans and (b) how these plans would need to adjust should the city decide to site the data center.
- Economic risks versus opportunities: Explain and balance the economic pros and cons. Regarding pros, can the data center create jobs, are these jobs needed in the city, considering its current industrial composition and employment environment? Regarding cons, what financial burdens, such as increased energy costs, may befall the community? Weigh these pros and cons against one another.
- Regulatory landscape: What federal and/or local regulations are relevant to the decision and why? What are the limits set by these regulations?
- Solutions & Strategies: What strategies may be employed by the city to mitigate risks posed by siting the data center? Consider: If foreseeable water strain is a risk of siting the data center, what strategies may be employed to remedy the strain on the water supply? What if the energy supply in the present grid is insufficient, is it possible to add new capacity—and will that capacity be renewable (and thus serving existing local environmental goals), if so, how?
- Stakeholders:
 - Mapping: Identify stakeholders relevant to the siting decision and their interests by filling out all tabs in the “Stakeholder Mapping for Final” file. This includes government, politicians, business, civic sector and academic. Fill out each column in each tab, giving careful thought in particular to “Stakeholder Roles” and “Influence-Interest”, the former indicating what the stakeholder would do, and the latter indicating what their underlying motivation (think what stake they have in the matter) is.
 - Engagement: Propose engagement strategies for each of the identified stakeholders, including (1) what information will be sought from them—especially inputs that will assist in decision making for siting the data center, such as evaluation of risks/opportunities faced by those stakeholders. (2) Propose partnerships made with stakeholders and public investments that could manage those risks/opportunities in the event that the data center is sited.
- Decision making: Synthesize the lessons learned and information gathered above, and produce decision making criteria that will assist leaders. This includes establishing reasonable thresholds of risks beyond which siting the data center becomes unacceptable, prioritizing stakeholder needs, and defending your confidence in policy solutions to those risks, if indeed solutions are possible. Consider the following:
 - At what level of environmental harms does siting a data center become untenable despite economic benefits? How do you define those parameters?
 - If stakeholder inputs are at odds, some favoring, some opposing, how do you decide which stakeholder opinions and needs to prioritize?

- Regarding Solutions & Strategies, are there strategies at hand that can reduce the risks you identified of siting the data center? If so, how confident are you that these solutions can collectively balance pros and cons of the center, and why? If not, does this translate to a “no” decision?

Extra credit: Republic services offer recycling and curbside composting in other cities but not Vegas, due in part due to an old franchise agreement from the 1990s that keeps getting renewed. Write an updated one based on what its doing in other cities.

https://www.clarkcountynv.gov/assets/documents/business/doing_business_with_clark_county/divisions/franchise_services/republic-services-franchise-agreement-2022-signed.pdf