

**Sustainable Energy Strategies, Environmental Studies Department, San José State University  
ENVS 133, Section 81, Spring 2022**

**Instructor:** Dr. Dustin Mulvaney (pronouns: he/him), Professor, Environmental Studies  
**Office Location:** 115A Washington Hall  
**Email:** [dustin.mulvaney@sjsu.edu](mailto:dustin.mulvaney@sjsu.edu)  
**Office hours:** Wednesdays 1–3 PM or by appointment  
**Class Days/Time:** Wednesday 3–5:45 AM  
**Classroom:** Zoom (see canvas for information)  
**Prerequisites:** ENVS 119 (preferred, not required)

**Course Description:** This course will provide students with a comprehensive overview of energy efficiency, energy conservation, and energy generation opportunities for transitioning to a sustainable energy economy. Students will learn about metrics and assessment tools to evaluate alternative modes of transportation, transportation fuels, electricity infrastructure, designs in the build environment and other green infrastructures and their impacts on greenhouse gas emissions, land use, ecological systems, air pollutants, and environmental justice. Students will assess the biophysical constraints and opportunities for sustainable energy deployment. The class is designed to be interdisciplinary, putting energy studies research into conversations in environmental sociology, political ecology, and science & technology studies help us understand, explain, and advocate for energy transitions. Topics include well-to-wheels calculators and low carbon fuel standard; techno-ecological synergies with solar, wind power siting and public participation, geothermal, bioenergy, storage (fuel cells, batteries), and electricity transmission, integration, and opportunities for grid defection. Most of the energy sources that power human activities are unsustainable, so pursuing sustainable energy options will be critical to the long-term survival and prosperity of human civilization.

Required Book

**Dustin Mulvaney. 2020. Sustainable Energy Transitions: Socio-Ecological Dimensions of Decarbonization. Palgrave-MacMillan/Springer.**

<https://link.springer.com/book/10.1007/978-3-030-48912-0>

<https://www.amazon.com/Sustainable-Energy-Transitions-Socio-Ecological-Decarbonization/dp/3030489116>

<https://www.palgrave.com/us/book/9783030489113>

\*\*If you are having any financial hardship, please email your mailing address and I will send the book in the mail. No questions asked.

**Class & Reading Schedule** (subject to change with fair notice)

Lecture topic	Readings/Assignments
First Class, green sheet, overview	Deep decarbonization strategies for California
<p><b>1</b></p> <p><b>How do we define sustainable energy transitions?</b></p>	<p><b>Assignment 1– Sustainable Transportation Supply Chains</b></p> <p><b>Mulvaney. 2020. Sustainable Energy Transitions Chapter 1</b></p> <p>Listen: Energy transition show podcast [Episode # 81]  <a href="https://xenetwork.org/ets/episodes/episode-81-principles-of-energy-transition/">https://xenetwork.org/ets/episodes/episode-81-principles-of-energy-transition/</a></p> <p>Kallis, G., 2011. In defense of degrowth. <i>Ecological Economics</i>, 70(5), pp.873–880.</p> <p>Schwartzman, D., 2016. How Much and What Kind of Energy Does Humanity Need? <i>Socialism and Democracy</i>, 30(2), pp.97–120.</p> <p>Smil, V., 2016. Examining energy transitions: A dozen insights based on performance. <i>Energy Research &amp; Social Science</i>, 22, pp.194–197.</p> <p>Sovacool, B.K., 2016. How long will it take? Conceptualizing the temporal dynamics of energy transitions. <i>Energy Research &amp; Social Science</i>, 13, pp.202–215.</p> <p>Listen: Energy transition show podcast [Episode #81] – Principles of Energy Transition. <a href="https://xenetwork.org/ets/episodes/episode-81-principles-of-energy-transition/">https://xenetwork.org/ets/episodes/episode-81-principles-of-energy-transition/</a></p>
<p><b>2</b></p> <p><b>Fundamentals of Energy Science</b></p>	<p><b>Sustainable Energy Transitions Chapter 2</b></p> <p>Listen: Energy transition show podcast [Episode #123] - Sustainable Energy Transitions. <a href="https://xenetwork.org/ets/episodes/episode-123-sustainable-energy-transitions/">https://xenetwork.org/ets/episodes/episode-123-sustainable-energy-transitions/</a></p>
<p><b>3</b></p> <p><b>Energy and the Social Sciences</b></p>	<p><b>Assignment 1 due</b></p> <p><b>Sustainable Energy Transitions Chapter 3</b></p> <p>Listen: Energy transition show podcast [Episode #99] – Metals Supply in Energy Transition. <a href="https://xenetwork.org/ets/episodes/episode-99-metals-supply-in-energy-transition/">https://xenetwork.org/ets/episodes/episode-99-metals-supply-in-energy-transition/</a></p> <p>Optional reading. Sovacool 2020.</p>
<p><b>4</b></p> <p><b>Fossil Fuels &amp;</b></p>	<p><b>Assignment 2 due</b></p> <p><b>Sustainable Energy Transitions Chapter 4</b></p>

<b>Resources</b>	<p>Chattopadhyay, D. et al. 2021. Accelerating the coal transition.  <a href="https://www.sciencedirect.com/science/article/pii/S1040619020301986">https://www.sciencedirect.com/science/article/pii/S1040619020301986</a></p>
<p>5</p> <p><b>Nuclear &amp; Renewables</b></p>	<p><b>Assignment 2</b></p> <p><b>Sustainable Energy Transitions Chapter 5</b></p> <p>Zweibel, K., Mason, Fthenakis, V. 2007. The Solar Grand Plan. Scientific American.</p> <p>Dvorak, M. J., Archer, C. L., &amp; Jacobson, M. Z. (2010). Renewable Energy. <i>Renewable Energy</i>, 35(6), 1244–1254.  <a href="http://doi.org/10.1016/j.renene.2009.11.022">http://doi.org/10.1016/j.renene.2009.11.022</a></p> <p>Roberts, D. 2016. The key to tackling climate change: electrify everything. <i>Vox</i>. <a href="https://www.vox.com/2016/9/19/12938086/electrify-everything">https://www.vox.com/2016/9/19/12938086/electrify-everything</a></p> <p>Pepin, I. 2018. Keeping the balance: How flexible nuclear operation can help add more wind and solar to the grid. <a href="https://news.mit.edu/2018/flexible-nuclear-operation-can-help-add-more-wind-and-solar-to-the-grid-0425">https://news.mit.edu/2018/flexible-nuclear-operation-can-help-add-more-wind-and-solar-to-the-grid-0425</a></p> <p>Listen: Energy transition show podcast [Episode #132] Jenny Chase, the Future of Solar. <a href="https://xenetwork.org/ets/episodes/episode-132-the-future-of-solar/">https://xenetwork.org/ets/episodes/episode-132-the-future-of-solar/</a></p> <p>Listen: Energy transition show podcast [Episode #30] The future of wind. <a href="https://xenetwork.org/ets/episodes/episode-30-the-future-of-wind/">https://xenetwork.org/ets/episodes/episode-30-the-future-of-wind/</a></p> <p>Further listening: Energy transition show podcast [Episode #72] the future of solar. <a href="https://xenetwork.org/ets/episodes/episode-72-future-of-solar/">https://xenetwork.org/ets/episodes/episode-72-future-of-solar/</a></p>
<p>6</p> <p><b>Sustainable Energy Indicators</b></p>	<p><b>Assignment 2 in class discussion</b></p> <p><b>Sustainable Energy Transitions Chapter 6</b></p> <p>Smil, V. (2010), Power Density Primer, Parts 1–5, pages 1–18.</p> <p>Listen: Energy transition show podcast [Episode #59] – Lifecycle Assessment <a href="https://xenetwork.org/ets/episodes/episode-59-lifecycle-assessment/">https://xenetwork.org/ets/episodes/episode-59-lifecycle-assessment/</a></p> <p>Listen: Energy transition show podcast [Episode #7] – EROI <a href="https://xenetwork.org/ets/episodes/episode-7-eroi/">https://xenetwork.org/ets/episodes/episode-7-eroi/</a></p> <p>Optional Listen: Energy transition show podcast [Episode #54] –Resource Limitations <a href="https://xenetwork.org/ets/episodes/episode-54-resource-limitations/">https://xenetwork.org/ets/episodes/episode-54-resource-limitations/</a></p>

<p>7</p> <p><b>Low Carbon Electricity Systems</b></p>	<p><b>Assignment 2 Due</b>  <b>Assignment 3 assigned</b></p> <p><b>Sustainable Energy Transitions Chapter 7</b></p> <p>Decarbonizing California’s Energy Diet . Bill Lane Center for the American West. <a href="https://west.stanford.edu/news/blogs/and-the-west-blog/2017/decarbonizing-california-electricity">https://west.stanford.edu/news/blogs/and-the-west-blog/2017/decarbonizing-california-electricity</a></p> <p>Listen: Energy transition show podcast [Episode #46] – Is 100% Renewables Realistic? <a href="https://xenetwork.org/ets/episodes/episode-46-100percent-renewables/">https://xenetwork.org/ets/episodes/episode-46-100percent-renewables/</a></p> <p>Listen: Energy Transition Show podcast: [Episode #60] – Demand Flexibility. <a href="https://xenetwork.org/ets/episodes/episode-60-demand-flexibility/">https://xenetwork.org/ets/episodes/episode-60-demand-flexibility/</a></p> <p>Jacobson, M. Z., Delucchi, M. A., Ingraffea, A. R., Howarth, R. W., Bazouin, G., Bridgeland, B., et al. (2014). A roadmap for repowering California for all purposes with wind, water, and sunlight. <i>Energy</i>, 73(C), 875–889. <a href="http://doi.org/10.1016/j.energy.2014.06.099">http://doi.org/10.1016/j.energy.2014.06.099</a></p> <p>Delucchi et al. (2011). Wind, Water, and Solar Power for the World. <a href="http://spectrum.ieee.org/energy/renewables/wind-water-and-solar-power-for-the-world/0">http://spectrum.ieee.org/energy/renewables/wind-water-and-solar-power-for-the-world/0</a></p> <p>OPTIONAL</p> <p>Hoffacker, M. K., Allen, M. F., &amp; Hernandez, R. R. (2017). Land-sparing opportunities for solar energy development in agricultural landscapes: a case study of the Great Central Valley, CA, United States. <i>Environmental science &amp; technology</i>, 51(24), 14472-14482.</p> <p>Listen Cultures of Energy podcast: #9 Laura Watts. <a href="http://culturesofenergy.com/ep-9-laura-watts/">http://culturesofenergy.com/ep-9-laura-watts/</a></p> <p>Kane, M. 2005. California Small Hydropower and Ocean Wave Energy Resources. California Energy Commission. <a href="http://www.energy.ca.gov/2005publications/CEC-500-2005-074/CEC-500-2005-074.PDF">http://www.energy.ca.gov/2005publications/CEC-500-2005-074/CEC-500-2005-074.PDF</a></p>
<p>8</p> <p><b>Low Carbon Mobility</b></p>	<p><b>Assignment 3 due</b>  <b>Assignment 4 assigned</b></p> <p><b>Sustainable Energy Transitions Chapter 8</b></p> <p>Listen: Energy transition show podcast [Episode #75] – Transportation Transition <a href="https://xenetwork.org/ets/episodes/episode-75-transportation-">https://xenetwork.org/ets/episodes/episode-75-transportation-</a></p>

	<p><a href="#">transition/</a></p> <p>Sperling, D., &amp; Eggert, A. (2014). California's climate and energy policy for transportation. <i>Energy Strategy Reviews</i>, 5, pp.88-94.</p> <p>Sperling, D &amp; Yeh, S. (2009). Low Carbon Fuel Standards Issues in Science and Technology. Winter.</p> <p>Listen: Podcast, interview with Union of Concerned Scientists and Professor David Tilman on biofuels. <a href="https://www.kalw.org/post/one-planet-what-are-environmental-impacts-biofuel-production#stream/0">https://www.kalw.org/post/one-planet-what-are-environmental-impacts-biofuel-production#stream/0</a></p> <p>OPTIONAL</p> <p>Sheehan. 2009. Sustainable Biofuels. A commonsense perspective on California’s approach to biofuels &amp; global land use. Industrial Biotechnology.</p> <p>Scarlot &amp; Dellemand. 2011. Recent developments of biofuels/bioenergy sustainability certification: A global overview <i>Energy Policy</i> 39: 1630–46.</p> <p>Listen: Energy Transition Show podcast: [Episode #25] – The Energy-Water Nexus. <a href="https://xenetwork.org/ets/episodes/episode-25-the-energy-water-nexus/">https://xenetwork.org/ets/episodes/episode-25-the-energy-water-nexus/</a></p> <p>Fulton &amp; Cooley. 2015. The water footprint of California’s energy system 2002–2014. <a href="http://pacinst.org/wp-content/uploads/sites/21/2015/03/Fulton-and-Cooley-EST-Manuscript-Final2.pdf">http://pacinst.org/wp-content/uploads/sites/21/2015/03/Fulton-and-Cooley-EST-Manuscript-Final2.pdf</a></p> <p>Jim Lazar, Teaching the Duck to Fly, Second Edition. <a href="https://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-teachingtheduck2-2016-feb-2.pdf">https://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-teachingtheduck2-2016-feb-2.pdf</a></p>
<p><b>9</b></p> <p><b>Low Carbon Industries and the Built Environment</b></p>	<p><b>Assignment 4 due</b></p> <p><b>Sustainable Energy Transitions Chapter 9</b></p> <p>Read excerpt of: Harvey et al. 2018. Designing Climate Solutions. Island Press. <a href="https://islandpress.org/books/designing-climate-solutions">https://islandpress.org/books/designing-climate-solutions</a></p> <p>Listen: ETS [Episode #84] – Designing Climate Solutions <a href="https://xenetwork.org/ets/episodes/episode-84-designing-climate-solutions/">https://xenetwork.org/ets/episodes/episode-84-designing-climate-solutions/</a></p>
<p><b>10</b></p> <p><b>Sustainable and Just Energy Systems</b></p>	<p><b>Sustainable Energy Transitions Chapter 10</b></p> <p>Dietz, et al. 2009. Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. <i>Proc. of the National Academy of Sciences</i> 106(44): 18452–6. <a href="http://dx.doi.org/10.1073/pnas.0908738106">http://dx.doi.org/10.1073/pnas.0908738106</a></p> <p>Dietz. 2010. Narrowing the US energy efficiency gap. <i>Proceedings of the National Academy of Sciences</i> 107(37): 16007–8. <a href="http://dx.doi.org/10.1073/pnas.1010651107">http://dx.doi.org/10.1073/pnas.1010651107</a></p>

	Listen Cultures of Energy podcast: 166 – Kyle Powys Whyte <a href="http://culturesofenergy.com/166-kyle-powys-whyte/">http://culturesofenergy.com/166-kyle-powys-whyte/</a>
11	Research projects  Listen: ETS [Episode #141] <a href="https://xenetwork.org/ets/episodes/episode-141-making-climate-policy-work/">https://xenetwork.org/ets/episodes/episode-141-making-climate-policy-work/</a>
12	Roundtable discussion, sustainable energy policy  Listen ETS [Episode #121] – Winning and Losing the Policy Game <a href="https://xenetwork.org/ets/episodes/episode-121-winning-and-losing-the-policy-game/">https://xenetwork.org/ets/episodes/episode-121-winning-and-losing-the-policy-game/</a>
13	Individual Research Presentations – <b>Research paper due</b>
14	Team Presentations – <b>Group project due (finals week)</b>

**Canvas & MYSJSU Messaging:** You are responsible for regularly checking the canvas emails and messaging system through <http://my.sjsu.edu> and <https://sjsu.instructure.com>

### Course Goals and Student Learning Outcomes

At the end of this course, students should be able to:

- Understand the opportunities for renewable and alternative energy deployment.
- Understand and assess the renewable energy resource base on Earth.
- Describe basic principles to improve efficiency and design of energy delivery, recognize opportunities to reduce energy consumption, and promote sustainability.
- Assess basic economic, government policy, and social equity dimensions of alternative energy options

**Environmental Studies Library Liaison:** Peggy Cabrera, [Peggy.Cabrera@sjsu.edu](mailto:Peggy.Cabrera@sjsu.edu)

[https://libguides.sjsu.edu/environmental\\_studies](https://libguides.sjsu.edu/environmental_studies)

**Classroom Protocol:** You are expected to come to every class on time. Coming into class late is a disturbance to others. Classroom participation is 20% of your grade, and classroom disturbance will be reflected in participation scores. **No cell phone, emailing, or text messaging during class.** If you need to make a phone call or send an email, please excuse yourself from class.

### University Policies

#### General Expectations, Rights and Responsibilities of the Student

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. To learn important campus information, view [University Policy S90–5](http://www.sjsu.edu/senate/docs/S90-5.pdf) at <http://www.sjsu.edu/senate/docs/S90-5.pdf> and SJSU current semester's, at <http://info.sjsu.edu/static/catalog/policies.html> In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not address the issue, it is recommended that the student contact the Department Chair as the next step.

**Dropping and Adding:** Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Add/drop deadlines can be found on the current academic year calendars document on the

[Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars) at [http://www.sjsu.edu/provost/services/academic\\_calendars](http://www.sjsu.edu/provost/services/academic_calendars) The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy> Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising) at <http://www.sjsu.edu/advising>

**Course Requirements & Assignments:** SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>

**Required Readings:** These are posted or linked on canvas. There is a required text book Mulvaney 2020 and podcast subscription to the Energy Transition Show.

**REQUIRED PODCAST SUBSCRIPTION – Energy transition show hosted by Chris Nelder**

<https://xenetwork.org/ets/student-offer/>

Having trouble? write [support@xenetwork.org](mailto:support@xenetwork.org) and they’ll sort it out.

**How do I turn in papers?** All papers are turned in via canvas.

**GRADING** is based on.

**10% Participation.** Share your thoughts about the readings, ask thoughtful questions, answer discussion prompts. Keeping good notes about the main points or views taken by authors is a good means a facilitating a sustained discussion. You will also be asked to work in small groups now and then in class, and you will be expected to be a contributing member to your group. In this class you will be using social media and social media posts will count towards participation. You will be required to make six posts throughout the semester to Energy Twitter.

**30% Assignments:** There will six assignments that must be completed.

1. A1 – Assignment 1 – Supply Chains, Sustainability, & Social Justice
2. A2 – Assignment 2 – Well-to-Wheel Analysis
3. A3 – Assignment 3 – Renewable electricity fleet calculators
4. A4 – Assignment 4 – Public participation in wind power siting
5. A5 – Assignment 5 – Household Energy Calculator

**30% Individual Research Project:** An individual research project on a sustainable energy strategy or source.

**30% Sustainable Energy Strategy Team Projects:** Students will develop a team projects related to the decarbonization of California’s energy systems and economy. Students will be on four different teams throughout the semester. (1) Transportation, (2) Electricity, (3) Residential energy use, (4) Commercial and Industrial sectors.

**Course Grading**

The course grade will be determined based on a total 100 possible points. Accumulated points that fall within the grade scale below determine your semester grade.

A+ 97–100	A 92–96	A- 89–91	B+ 86–88	B 81–85	B- 79–80	C+ 76–78
C 72–76	C- 69–71	D+ 67–68	D 64–66	D- 60–64	F < 60	

**University policy on academic integrity**

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct) is available at <http://www.sjsu.edu/studentconduct>

**Instances of academic dishonesty will not be tolerated.**

Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your

assignment or any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy S07-2 requires approval of instructors.

### **Campus policy in compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

### **Other Campus Resources**

- Computer labs for student use are available in the [Academic Success Center](http://www.sjsu.edu/at/asc/) at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.
- **Peer Connections** <http://peerconnections.sjsu.edu> is located on the 1<sup>st</sup> floor of Clark Hall in the Academic Success Center as well as in Room 600 in the Student Services Center. Peer Connections' free tutoring and mentoring is designed to assist students in the development of their full academic potential and to inspire them to become independent learners. Peer Connections tutors are trained to provide content-based tutoring in many lower division courses (some upper division) as well as writing and study skills assistance. Small group and individual tutoring are available. Peer Connections mentors are trained to provide support and resources in navigating the college experience. This support includes assistance in learning strategies and techniques on how to be a successful student. Peer Connections has a learning commons, desktop computers, and success workshops on a wide variety of topics. For more information on services, hours, locations, or a list of current workshops, please visit [Peer Connections website](http://peerconnections.sjsu.edu) at <http://peerconnections.sjsu.edu> for more information.
- The SJSU **Writing Center** is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook.
- **SJSU Counseling and Psychological Services** The SJSU Counseling and Psychological Services is located on the corner of 7th Street and San Carlos in the new Student Wellness Center, Room 300B. Professional psychologists, social workers, and counselors are available to provide confidential consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling and Psychological Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.