

# ENVIRONMENT AND RESOURCES (ENVRES)

## ENVRES 199. Independent study. 1-5 Unit.

Same as: ENVRES 299

## ENVRES 201. Designing and Evaluating Community Engagement Programs for Social and Environmental Change. 3 Units.

Non-profit organizations seeking to achieve social and environmental change often run outreach and education programs to engage community members in their cause. Effective application of social science theory and methods may improve the design and evaluation of such community engagement programs. In this class, we partner with environmental and social justice organizations in the Bay Area to explore two questions: 1) How can recent findings from the social sciences be applied to design more effective community engagement programs? 2) How can we rigorously evaluate outreach and education programs to ensure they are achieving the desired objectives? The course will include an overview of key theories from psychology, sociology, and education, field trips to partnering organizations, and a term-long community-engaged research project focused on designing and/or evaluating a local outreach or educational program that is meant to achieve social and environmental change.

Same as: EARTHSYS 130

## ENVRES 215A. Topics in International Justice, Rights, and the Environment. 1-3 Unit.

As the effects of environmental change are increasingly felt by people around the globe—whether point-source pollution from factories, livelihood deterioration from overfishing, or exposure to climate change impacts—it is more urgent than ever that we engage critically and creatively with the justice, ethics, and rights implications of these changes. Topics that will be addressed in this survey course include marine justice, climate justice and ethics, environmental racism, social movements, resource degradation, and neoliberal conservation. Through guest lectures, student-led discussions, readings, and creative writing, students will engage with cutting-edge research on these topics. The course offers two enrollment options: a 1-unit lecture that meets once a week and a 3-unit lecture that meets twice a week with a follow-up discussion sections.

## ENVRES 220. The Social Ocean: Human Dimensions of Coastal and Marine Ecosystems. 1-2 Unit.

This interdisciplinary seminar examines human dimensions of current ocean issues through a series of readings, discussions, and guest lecturer presentations. Through the lenses offered by multiple disciplines and fields, we will examine and reinterpret the challenges of fisheries management, climate change, conservation/restoration, and human rights. We will welcome specialists in industry, academia, law, and the nonprofit sector to discuss theories of change for ocean issues, with a particular emphasis on marine justice. We invite students to create and share their own “Social Ocean Project,” synthesizing course themes and personal reflections.

## ENVRES 221. New Frontiers and Opportunities in Sustainability. 1 Unit.

Interdisciplinary exploration of how companies, government and non-profit organizations address some of the world's most significant environmental & resource sustainability challenges. Each week we will explore with an experienced sustainability practitioner new frontiers and opportunities in clean tech, policy, energy, transportation, consumer goods, agriculture, food, and sustainable built environments.

## ENVRES 222. Climate Law and Policy. 3 Units.

This course offers an interdisciplinary, graduate-level survey of historical and current efforts to regulate emissions of greenhouse gases in the United States. Students will read primary legal documents, including statutes, regulations, and court cases in order to evaluate the forces and institutions shaping American climate policy. Although the class will focus on the intersection of climate policy and the legal system, no specific background in law is necessary. Elements used in grading: Grades will be based on class attendance, class participation, and either written assignments and an exam. Cross-listed with LAW 2520.

## ENVRES 223. Topics in Writing & Rhetoric: Introduction to Environmental Justice: Race, Class, Gender and Place. 4 Units.

This course examines the rhetoric, history and key case studies of environmental justice while encouraging critical and collaborative thinking, reading and researching about diversity in environmental movements within the global community and at Stanford, including the ways race, class and gender have shaped environmental battles still being fought today. We center diverse voices by bringing leaders, particularly from marginalized communities on the frontlines to our classroom to communicate experiences, insights and best practices. Together we will develop and present original research projects which may serve a particular organizational or community need, such as racialized dispossession, toxic pollution and human health, or indigenous land and water rights, among many others. Prerequisite: PWR 2. Same as: EARTHSYS 194, PWR 194EP

## ENVRES 225. E-IPER Current Topics Seminar. 1 Unit.

For E-IPER Ph.D and Joint M.S. students only. Weekly presentations of E-IPER students' research and other program-related projects. Occasional guest speakers. Individual or team presentation, active participation, and regular attendance required for credit. May be taken for credit a maximum of two times. Enrollment by department consent only. Contact instructor for permission to enroll.

## ENVRES 226. Energy Law. 3 Units.

Modern energy systems aim to deliver a supply of reliable, low-cost, and clean energy; in turn, they require massive capital investments in infrastructure projects, some of which have the features of a natural monopoly and therefore require ongoing economic regulation. The U.S. energy system today is subject to a complex regime of state and federal laws. We will examine the historical role of state-level electric utility regulation, tracing its evolution into the various forms of regulated and deregulated energy markets now in use in the U.S. electricity and natural gas sectors. Contemporary energy law increasingly involves a delicate federalist balance where state and federal regulators share overlapping authority in contested policy areas that are subject to major technological and economic change, as changes in the supply and costs of renewable and fossil energy resources alike transform the U.S. energy sector. Finally, we will interrogate the contested ideals of regulation and competition, which private, non-profit, and governmental stakeholders all deploy in legal and political fora to advance private gain and public goods; most recently in a series of transformative proposals to use federal emergency powers to provide financial bailouts to legacy fossil and nuclear power plants. Students who complete the class will gain a historical understanding of how economic regulation of the energy sector has evolved since the early 20th century, a durable conceptual framework for understanding modern energy law and policy debates, and a practical understanding of energy law designed for future practitioners. Non-law students interested in energy issues are highly encouraged to take this course, as energy law literacy is essential to careers in the sector. Elements used in grading: class participation, short written assignments, and a one-day take-home final exam. Cross-listed with LAW 2503.

**ENVRES 228. Private Environmental Governance. 2-3 Units.**

The tools of private environmental regulation (e.g., eco-certifications, CSR initiatives, supplier contracts) have become an increasingly important source of governance. But how do they work? How do they arise—why and how can corporations participate in these voluntary measures? How do they regulate firm behavior and how can regulators police the tools themselves? This interdisciplinary seminar examines these questions and more, with readings from traditional legal sources (cases, agreements), as well as from economics, political science, and social psychology. Guest speakers and case studies will add real-world context to our exploration of theory. Elements used in grading: Students may take the course for 2 units (Option 1) or 3 units (Option 2). Attendance, class participation, and short written assignments will factor into grades for both sections. Option 1 students will also prepare a private governance proposal and presentation. Option 2 students will write a research paper meeting the Law School's R paper requirements. Please note that the last two class sessions (May 21 and 28) will have to be rescheduled. Cross-listed with the Law School (LAW 2522).

**ENVRES 230. Field Survey Data Collection & Analysis. 3 Units.**

In this course we will examine a range of issues related to the collection and analysis of survey data. Topics will include initiating a survey, designing an instrument, conducting enumeration, converting data from questionnaires to digital files, data analysis, empirical modeling and presenting results. Technical components will also be highly focused on application and implementation, and while prior training in econometrics would be useful, it will not be a prerequisite. The course will be tailored so that some of the specific topics covered will be based on the needs and interests of the students.

**ENVRES 231. Qualitative Interviewing. 3 Units.**

Addressing the theoretical underpinnings of qualitative interviews as well as the application of theory to practice, this course considers different approaches to interviewing. Interview types covered will range from group interviews to individual interviews, and from unstructured, ethnographically oriented interviews to highly structured interviews. Working with community partners to facilitate application to practice, the students will move from theory to interview design, implementation, and initial stages of analysis, with an emphasis on consistency in approach and utility in graduate-level research.

Same as: EDUC 450C

**ENVRES 240. Environmental Decision-Making and Risk Perception. 1-3 Unit.**

Mobilizing successful conservation efforts to mitigate climate change and preserve both local and global ecosystems requires a new way of thinking. This course will investigate the barriers to pro-environmental behavior and the heuristics and biases that cloud our ability to respond effectively to environmental problems, using insights from behavioral economics, neuroeconomics, and environmental risk perception. Emphasis on interdisciplinary applications of recent research, and implications for environmental policymaking and persuasive messaging.

**ENVRES 245. Psychological Insights for Science Communication. 2-3 Units.**

This course integrates lessons learned from psychology, behavioral economics, marketing, and sociology to the practice of science communication, with practical experience working to create and test new messaging for partner environmental organizations. Students learn about innate biases and heuristics that influence the communication of scientific ideas and data and the public's receptiveness to environmental messaging. Topics covered include information framing, attention and salience, public science literacy and numeracy, simplifying complexity and dealing with uncertainty, cultural and political contexts and social norms, and methods to motivate science engagement, evidence-based decision-making, and behavior change. Students will learn how to design new messaging strategies based on social science research and how to analyze their efficacy using basic statistical analyses in R (no prior programming knowledge is required). The course culminates in a project developing and testing new messaging strategies for real-world environmental organizations.

**ENVRES 246. Measuring Success in Environmental Messaging. 1-2 Unit.**

How do we understand the impacts of environmental messaging on its target audience, and ensure that it provides compelling and informative content for education, outreach, and behavior change? Once different messaging campaigns have been attempted, how do we evaluate their success? This course teaches students practical social science approaches to assess the efficacy of environmental messaging campaigns by real environmental nonprofit organizations. As a continuation of ENVRES 245, students will work with partner nonprofit organizations to analyze the performance of campaigns designed in the previous quarter, and identify the most salient and motivational aspects of the campaigns that best predicted successful and meaningful outcomes. The course will also focus on how to evaluate outcomes across heterogeneous populations, to better understand how messaging may impact a diverse audience. The statistical computing language R will be used in the course, but prior programming experience is not required. Prerequisite: ENVRES 245 : Psychological Insights for Science Communication or consent of instructor required.

**ENVRES 250. Environmental Governance. 3 Units.**

How do we work together to solve environmental problems? Across the globe, who has a voice, and who ultimately decides how to balance conservation and development? How do we build governance institutions that facilitate both environmental sustainability and social equity? This seminar on environmental governance will focus on the challenges and opportunities for managing common-pool resources, like fisheries, forests, and water. Because managing environmental resources is often about managing people, we will explore the motivations underlying human behavior towards the environment. We will discuss how institutions encode our cultural values and beliefs, and how we can reshape these institutions to achieve more sustainable outcomes. Coursework includes foundational readings and a pragmatic exploration of case studies. Teaching cases address topics in community-based conservation, international protected areas, market-based approaches, coping with environmental risk, and other themes. Interested undergraduate and graduate students from any discipline are welcome. Same as: EARTHSYS 254

**ENVRES 255. Moral, Civic, and Environmental Education. 3 Units.**

An examination of the conceptual foundations that underlie moral, civic, and environmental action in contemporary society, and the social, cognitive, and motivational capacities that make possible constructive participation. The course will discuss both in-school and beyond-schools ways in which young people can be educated for informed and constructive participation. Among the educational methods to be considered will be narrative treatments of exemplary figures in the moral, civic, and environmental domains. Same as: EDUC 379

**ENVRES 260. Implementing & Financing a Decarbonized Economy. 3 Units.**

In the forthcoming decades, the transition to a global low-carbon economy will require tens of trillions of dollars worth of capital investment. Much of that capital investment will be directed towards new builds, or retrofits, of major capital projects. This course aims to give students a very practical and detailed introduction to the opportunities and challenges of developing and financing such major capital projects. Each of the instructors has decades of hands-on experience in developing and financing major capital projects. The process of developing and financing major capital projects is inherently very multidisciplinary—including engineering, business, finance, legal and (often) international relations principles. The course will start at a high level, covering the emissions landscape, policy framework, markets, and main technologies. Then we will dive much deeper into such key tasks as permitting; engineering and resource studies; project pro forma models; successfully negotiating project construction contracts and output sales contracts; arranging the financial terms and legal provisions of bank or bond debt financing; maximizing returns to equity; and monetizing tax and other governmental incentives. Students should be eager to engage in a multi-disciplinary approach both in terms of how to think about the subject matter and in terms of interacting with fellow students who bring a different academic and/or work experience than their own. Class preparation for the bi-weekly sessions will require watching a pre-recorded lecture, literature review or case reading, and homework assignments designed to reinforce principles learned. A four-part case study encompassing the development of a 500 MW solar project will be used early on in the class to acquaint students with the tools and issues of project development. We plan to reserve the 1.5 hour class sessions for homework review, student case study analysis, reinforcement of technical concepts, and free-form discussion. Finally, we will divide the class into small teams to do final group projects that will be presented during the last few class sessions. The instructors do not require prior coursework in finance; and we will provide basic background materials and additional tutorials, as needed, to bring students up to the technical level required to do the coursework successfully. CONSENT OF PROGRAM FORM: In order to be considered for enrollment, please complete the Consent of Program Form: <https://forms.gle/U3gbzjcSgD7vpayf8> by Sunday, January 3rd at 11:59pm PST. Successful applicants will be notified when permission has been granted and will receive a permission number to register for the course in Axxess by Wednesday, January 6th. Forms received after the deadline will be reviewed on a rolling basis until the class is full. ENVRES 260 is capped at 20 students. Some priority will be given to E-IPER graduate students.

**ENVRES 270. Graduate Practicum in Environment and Resources. 1-5 Unit.**

Opportunity for E-IPER students to pursue areas of specialization in an institutional setting such as a laboratory, clinic, research institute, governmental agency, non-governmental organization, or multilateral organization. Meets US CIS requirements for off-campus employment with endorsement from designated school official.

**ENVRES 280. Topics in Environment and Resources. 2 Units.**

Required core course restricted to E-IPER Joint M.S. and Dual M.S. students. This course functions as a gateway to fundamental concepts in environment, energy and sustainability. Topics include climate change, ecosystem services, life cycle assessment, energy systems, food systems, and others. Students engage with affiliated faculty, and begin to develop ways to integrate science and technology with business, law and other professional skills to solve environment and resource problems.

**ENVRES 290. Capstone Project Seminar in Environment and Resources. 3 Units.**

Required for and limited to E-IPER Joint M.S. and Dual M.S. students. Propose, conduct and publicly present final individual or team projects demonstrating the integration of professional (M.B.A., J.D., M.D., M.I.P., or Ph.D.) and M.S. in Environment and Resources degrees. Presentation and submission of final product required.

**ENVRES 295. Carbon Dioxide and Methane Removal, Utilization, and Sequestration. 1 Unit.**

This is a seminar on carbon dioxide and methane removal, utilization, and sequestration options, and their role in decarbonizing the global energy system. This course will cover topics including the global carbon balance, utilizing atmospheric carbon in engineered solutions, recycling and sequestering fossil-based carbon, and enhancing natural carbon sinks. The multidisciplinary lectures and discussions will cover elements of technology, economics, policy and social acceptance, and will be led by a series of guest lecturers. Short group project on carbon solutions. Same as: EARTHSYS 308, ENERGY 308, ESS 308, ME 308

**ENVRES 299. Independent study. 1-5 Unit.**

Same as: ENVRES 199

**ENVRES 300. Introduction to Resource, Energy and Environmental Economics. 3 Units.**

Required core course restricted to first year E-IPER Ph.D. students. Examination of environmental, energy and natural resource management problems through the lens of economics, with an emphasis on hands-on practical problem-solving. Topics include market failure, cost-benefit analysis, finance, risk & uncertainty, non-market valuation, regulation, green accounting, rent, renewable resources, exhaustible resources, including energy, and biodiversity. Prerequisite: proficiency in multivariate calculus. Knowledge of basic microeconomics helpful but not essential.

**ENVRES 315. Environmental Research Design Seminar. 1 Unit.**

Required core course restricted to first year E-IPER Ph.D. students. Series of faculty presentations and student-led discussions on interdisciplinary research design as exemplars of the research design theories discussed in ENVRES 320. Designing Environmental Research. Topics parallel the ENVRES 320 syllabus. Corequisite: ENVRES 320.

**ENVRES 320. Designing Environmental Research. 3-4 Units.**

Required core course restricted to first year E-IPER Ph.D. students. Research design options for causal inference in environmentally related research. Major philosophies of knowledge and how they relate to research objectives and design choices. Identification of critical elements within a broad range of research designs. Evaluation of the types of research questions for which different designs are suited, emphasizing fit between objectives, design, methods, and argument. Development of individual research design proposals, including description and justification understandable to a non-specialist. Enrollment by permission number only. Contact instructor for enrollment in course.

**ENVRES 320A. Interdisciplinary Environmental Research Epistemology. 1 Unit.**

Required introductory core course to ENVRES 320 restricted to first year E-IPER Ph.D. students. Research design options for causal inference in environmentally related research. Major philosophies of knowledge and how they relate to research objectives and design choices. Identification of critical elements within a broad range of research designs. Evaluation of the types of research questions for which different designs are suited, emphasizing fit between objectives, design, methods, and argument. Development of individual research design proposals, including description and justification understandable to a non-specialist.

**ENVRES 330. Research Approaches for Environmental Problem Solving. 3 Units.**

Required core course restricted to first year E-IPER Ph.D. students. How to develop and implement interdisciplinary research in environment and resources. Assignments include development of research questions, a preliminary literature review, and a summer funding proposal. Course is structured on peer critique and student presentations of work in progress. Corequisite: ENVRES 398 with a faculty member chosen to explore a possible dissertation topic.

**ENVRES 340. E-IPER PhD Writing Seminar. 1-2 Unit.**

Required core course restricted to second-year E-IPER PhD students. Actively pursue one or more writing goals relevant to this stage in their graduate studies in a structured setting. Set specific writing goals, create and follow a plan for reaching these goals, and receive substantive feedback on their written products from their peers. Examples of writing products include, but are not limited to, the student's dissertation proposal, E-IPER Fields of Inquiry essay, a literature review, or a grant or fellowship application. By the end of the course, students are expected to have completed or have made substantial progress toward their writing goal.

**ENVRES 341. Theoretical Underpinnings of Environmental Behavior: Exploration and reflection. 1-3 Unit.**

Human behavior is studied in many fields and disciplines at a range of scales, from the micro to the macro, with some focusing on the individual as the core, while others take a more critical approach. Theories and approaches from each can be considered in context with implications for the environment, resources, and sustainability-related issues. Using interdisciplinary frames, students in this doctoral-level seminar will apply various perspectives and lenses to advance their own empirical work through intensive, focused writing sessions. The intention is to provide a supportive structure such that students may advance their own in-progress research and ongoing writing grounded in behavioral science and social-ecological systems theories.

**ENVRES 380. Innovating Large Scale Sustainable Transformations/ Collaborating for the Future. 3-4 Units.**

The capacity to innovate system-level transformations is a crucial leadership modality in the face of complex systemic challenges. This class gives students the mindsets, theoretical framework, and hands-on experience in shaping innovative interventions that bring about scaled and profound transformations in the face of complex multi-factorial challenges. Students are immersed in the System Acupuncture Methodology, which combines systems thinking, strategy, design thinking, behavioral sciences, resilience theory, diffusion theory, decision theory, and a theoretical framework around scaled multi-stakeholder interventions. Tools and theories introduced in class will be used to structure large-scale transformations that simultaneously create sustainability and resilience on environmental, societal, and economic fronts. This project-based team-based class challenges students to find solutions for complex real-world challenges. Class meets in the spring quarter on Fridays 9:30am-4:20pm, weeks 1-9. Lunch will be provided. Final presentations on Friday of week 9, 3-7:30pm. Consent of instructor required. To be considered, please apply on the d.school website. Same as: SUST 230

**ENVRES 391. Curricular Practical Training. 1-3 Unit.**

Educational opportunities in research and development labs in industry. Qualified students engage in internship work and integrate that work into their academic program. Students register during the quarter they are employed and complete a research report outlining their work activity, problems investigated, results, and follow-on projects they expect to perform. Course may be repeated for credit.

**ENVRES 398. Directed Reading in Environment and Resources. 1-10 Unit.**

Under supervision of an E-IPER affiliated faculty member on a subject of mutual interest. Joint M.S. students must submit an Independent Study Agreement for approval. May be repeat for credit.

**ENVRES 399. Directed Research in Environment and Resources. 1-15 Unit.**

For advanced graduate students. Under supervision of an E-IPER affiliated faculty member. Joint M.S. students must submit an Independent Study Agreement for approval.

**ENVRES 801. TGR Project. 0 Units.**

**ENVRES 802. TGR Dissertation. 0 Units.**