The University of British Columbia

Vancouver School of Economics & Sauder School of Business

Bachelor of International Economics (BIE) Program

COEC 475 — The Economics & Policy of the Environment, Energy, and Natural Resources

Course Information

Course Code	2020W1 COEC 475 001
Credits	3.0
Instructor	Prof. Werner Antweiler
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Office Location	Henry Angus 275 / Personal Zoom Room 453 056 3390
Office Hours	Fridays 09:45-11:15 or by appointment
Class Times	Tue/Thu 15:30-17:00
Course Website	https://canvas.ubc.ca/

Virtual Classroom / Zoom Login 626 4390 5069 with password 294632

Course Format

We will use Zoom to have our classes during the scheduled class times. For this course, you are required to use a Zoom account during synchronous classes and office hours. If you do not have a Zoom account, you can create one here: https://zoom.us/signup. Note: creating a Zoom account requires that you provide a first name, last name, and email address to Zoom. For privacy purposes, you may consent to using your existing email address and your real name. Alternatively, if you prefer, you may sign up using an alternative email address and an anonymized name that does not identify you (i.e. Jane Doe, jane.doe@email.com). If you have trouble creating an account, or accessing a Zoom session, please contact CLCHelp@sauder.ubc.ca.

You will be required to provide the email address associated with your Zoom account in a Canvas quiz for identification purposes.

To help replicate the classroom experience, make sessions more dynamic and hold each person accountable, both students and instructors are asked to have their cameras on

during Zoom sessions. This is the desired norm for the Sauder undergraduate program as it will provide you the best learning experience. Students who require an accommodation with regard to the "camera on" requirement must contact their instructors in advance of the first class to discuss options. Students are expected to conduct themselves professionally by joining sessions on time, muting mics when not speaking, refraining from using any other technology when in-session, attending in attire you would normally wear to school, and participating from a quiet environment. Content from synchronous sessions will be selectively recorded per instructor discretion and made available to students on Canvas for a maximum duration of the course length. This is done to allow students the opportunity to return to lecture content to solidify learnings.

Virtual Classroom Instructions / Code of Conduct

This year's course will be taught in a virtual classroom using Zoom and not in a physical classroom. This necessitates a number of important adaptations and requires all students to adhere to a protocol for using Zoom. You will need to agree to the following terms of conduct:

1. I will be the only person viewing and listening to live courses when delivered.
2. I will not copy, film, audio record, share or in any way record or redistribute a class session.
3. I will not share the above Zoom links or invite any unauthorized party to attend this class.
4. Video recordings of our classes posted on Canvas may be accessed exclusively for your own studies; videos will be taken down at the end of the exam period.
5. I will engage in online classes in a professional and respectful manner, including:
    - having my camera on *at all times* during a class;
    - muting my microphone unless I am called upon to talk;
    - ensuring that I am in a quiet environment; and
    - attending classes with a *registered* Zoom account so your attendance can be identified.

Course Description

Economies around the world face increasing challenges managing their environmental problems and are working towards improving their energy systems, managing exhaustible resources responsibly, and sustaining renewable resources. Economic concepts help understand the sources of environmental problems and policy options for finding solutions to these problems.

Canada's environmental footprint is significantly influenced by the presence of a large natural resources industry (oil, gas, mining), and at the same time Canada's geographic size gives our country stewardship over vast natural resources (water, forests, land). The linkages between energy systems, natural resource extraction, and environmental outcomes make it useful to explore them in a framework that addresses sustainability challenges comprehensively. This course seeks to provide students with an advanced, yet highly accessible introduction to the various approaches to the relationship between economics and sustainability. It probes key questions that are vital for analyzing the environmental problems of today:

1. What is the effect of economic activities on the environment, across space and/or time?
2. How can businesses and governments choose among different options for products and public projects by using appropriate metrics for sustainability?
3. How can public policies be designed to influence environmental outcomes, incentivize sustainable resource use, or make our energy system more efficient?
4. What are best practices for making our economies more sustainable environmentally?
5. How can policy makers reconcile policy trade-offs between economic efficiency and fairness (distributional outcomes)?
6. How can environmental policies be coordinated effectively across jurisdictional borders?

This course provides an introduction to the economics and policy of the environment, energy, and natural resources that is aimed at students who already have an understanding of microeconomic principles and who are preparing to engage in independent research of their own in the BIE capstone course (ECON 494) in the following term. Therefore, this course is augmented with three full-lecture presentations (and discussions) of important research papers in order to showcase 'best practice' in research methodology and research communication. Furthermore, group work will allow students to investigate specific economic questions about environmental outcomes, resource management practices, or energy & electricity systems. Teams will present their findings to the class. This teamwork will enable students to link these economic questions to the broader context of public policy, environmental law, and technological innovation.

Learning Objectives

After successfully completing the course, students will be able to:

1. Discuss the environmental and sustainability challenges of our planet.
2. Understand the science, economics, and policy of climate change.
3. Describe the impact of pollution and pollution control.
4. Appreciate how businesses and governments use life-cycle assessment and environmental impact assessment to compare product and project alternatives.
5. Understand the differences between market-based and regulatory environmental policies and gain the ability to select policy instruments effectively.
6. Describe the different effects of environmental taxes, emission permit trading, subsidies, and hybrid policy instruments.
7. Appraise theoretical and empirical economic insights about natural resources extraction.
8. Assess the economic tools to manage renewable resources sustainably, in particular water systems, forests, and fisheries.
9. Understand the market dynamics of fossil fuel industries and energy markets.
10. Identify the challenges and opportunities for renewable energy systems.
11. Appraise the economic issues concerning electricity generation, electricity distribution, and electricity demand management.
12. Engage effectively in rigorous science-grounded discussions about environmental policy.
13. Appreciate the research methodologies and effective communication that are used in research published in major economics journals.
14. Explain, using diagrams and/or algebra, environmental policies and resource management practices.
15. Differentiate between the competing definitions of sustainability.

Prerequisites

Students taking COEC 475 must have completed Intermediate Microeconomics (ECON 315+316), Introduction to Empirical Methods (ECON 327), and Methods of Empirical Research (ECON 328). Because of overlap, students who take COEC 475 must not have taken ECON 371 (Economics of the Environment).

Course Resources and Materials

Textbooks: this course does not follow a specific textbook but recommends the Keohane/Olmstead book (se below) as the most suitable introductory reading. Additional chapters and newspaper articles will be made available to students as a course package. In addition to Keohane/Olmstead, the course will draw on material from the other books shown below:

- Nathaniel Keohane and Sheila M. Olmstead: *Markets and The Environment*, Island Press, second edition, 2016. Introductory level textbook.
- Werner Antweiler: *Elements of Environmental Management*, University of Toronto Press, 2014. Textbook for business students covering the intersection of economics, law, technology, and business strategy.
- Daniel Phaneuf and Till Requate: *A Course in Environmental Economics: Theory, Policy, and Practice*, Cambridge University Press, 2017. Graduate-level textbook.
- Godfrey Boule, Bob Everett, and Janet Ramge: *Energy Systems and Sustainability: Power for a Sustanabile Future*, Oxford University Press, 2nd edition, 2012.

Assigned research articles: see course topics page and embedded URLs.

Canvas: Access to all course resources (slides, readings, discussion forum, assignments, grades, and etc.) will be through Canvas. Please note that you need a Campus Wide Login (CWL) account to access the course web site.

Assessment

The following provides a brief description of each component included in the evaluation criteria. Detailed information on assignments and examinations will be presented in class and also available in the class website.

Evaluation	Weight	Graded as
Midterm Exam (1 hour)	20%	individual
Final Exam (2 hours)	40%	individual
Class Participation	10%	individual
Group Presentation	15%	group
Group Report	15%	group

Zoom polls: I will make extensive use of the Zoom polls in this course. Poll responses will be graded on a completion basis only and form the basis of your participation grade, but you must participate to receive credit. To receive credit for attendance, you *must* use a registered Zoom account and you need to enable the instructor to link your Zoom account to your student number.

Midterm exam: The 60-minute midterm exam is (tentatively) scheduled for Thursday October 15 and will be held in class. The material for the midterm will include everything covered up to the exam date. The one-hour midterm exam will be comprised of a true/false quiz with 32 statements grouped into eight blocks (worth 32 points) and a set of two (structured) short-essay questions (each worth 16 points). The midterm exam has a total of 64 points. During 2020W1, the midterm exam will be held online on Canvas. Remote monitoring tools such as Proctorio may be used to invigilate the exam.

Final exam: The final exam will encompass all lecture and reading materials covered in the course, with more emphasis on the topics covered after the midterm exam. The final exam will be held during the exam period for the term and will take 2.5 hours. The final exam will be comprised of a mixture of a true/false quiz with 48 statements grouped into 12 blocks (worth 48 points), a set of three short-essay questions (each worth 12 points), and a numerical exercise (worth 16 points). The final exam has a total of 100 points. During 2020W1, the final exam will be held online on Canvas. Remote monitoring tools such as Proctorio may be used to invigilate the exam.

Group project: The group project consists of an in-class presentation and an accompanying report. The purpose of the project is to develop an in-depth understanding of a particular policy problem in one of the three areas of this course (environment, natural resources, energy systems). Students are required to research the problem, analyze the market issues surrounding the problem, articulate the policy challenges and choices, and summarize the (possibly conflicting or competing) perspectives on the issue at hand. Each student will join one of ten teams. Teams will be balanced to have approximately equal number of students; the maximum is five members per team. Two teams will present during one of five presentation dates during the final month of the course. The following topics have been selected:

1. Offshore wind farms
2. Grid-connected home solar photovoltaics
3. Microgrids in developing countries
4. Large hydro dams in Canada (Site-C, Muskrat Falls)
5. Electric vehicle subsidies and incentives: comparisons
6. EV charging stations: problems and solutions
7. Maritime shipping and carbon emissions: technologies & policies
8. Aviation and carbon emissions: technologies & policies
9. Cruise ships: environmental profile, innovations & policies
10. Noise pollution in urban environments: problems and control policies

Alternative topics may be proposed by students and substituted if approved by the instructor. The presentation grade is determined as an equal-weighted average of the following evaluation criteria: (i) breadth and comprehensiveness of the research; (ii) depth and thoroughness of the research; and (iii) effectiveness of communication. Peer evaluations across teams will be used to form two-thirds of the presentation grade. Following the presentation, each team then prepares a written report detailing the elements of the project and responding to feedback on the presentation from the class and instructor.

A report should be between six and ten pages in length. Appendices with figures and/or tables may be added freely, and an additional page should list all sources and references. Reports are due on the last day of classes.

Participation grade: Participation grades combine attendance and a measure of quantitative and qualitative contributions. The baseline grade is 68 for full attendance of at least 20 of the 24 sessions. Students who have missed five ore more classes earn demerit points for non-attendance (3 points for the 5th missed lecture, and 5 points for each further missed lecture). An attendance sheet will be maintained on Canvas, with students identified by the four middle digits of your student number. Classes missed due to extenuating medical or hardship circumstances and reported to the Program Office are not counted as missed; please inform your instructor promptly if you miss (or expect to miss) a class for any pertinent reason.

Contributions to classroom discussions are rated on a 0–6 scale, where each scale step equals five points, and the student rated highest may earn two bonus points. Most students will typically be ranked in the 1–3 categories, ranging from speaking up infrequently (perhaps 1–4 times in total), to speaking up about every second class, to speaking up in about 2/3 of the classes. Students ranked in categories 4–6 are typically in the top quartile of the distribution, 5–6 in the top 10%, and category 6 are likely the top one or two students.

The table below shows the qualitative 0–6 scale with corresponding points and the attainable maximum participation grade when a student has no demerit points from missed classes. The most common categories are 1, 2, and 3, and thus the average participation grade is around 78. Students who achieve categories 4–6 stand out not only in terms of quantity of contributions but also qualitative measures such as analytic reasoning, critical thinking, and depth of knowledge.

Category	Contributions	Points	Maximum
0	none	0	68
1	infrequent	5	73
2	regular	10	78
3	elevated	15	83
4	very good	20	88
5	excellent	25	93
6	exceptional	30+2	100

Policies

Respectfulness in the classroom: Students are expected to be respectful of their colleagues at all times, including faculty, staff and peers. This means being attentive and conscious of words and actions and their impact on others, listening to people with an open mind, treating all UBC Sauder community members equally and understanding

diversity. Students who act disrespectfully toward others will be asked to leave the class and be marked as absent for the day. They may also be removed from a team, lose credit for in-class assessments and activities, or be asked to complete a group assignment individually.

Respect for Equity, Diversity, and Inclusion: The UBC Sauder School of Business strives to promote an intellectual community that is enhanced by diversity along various dimensions including status as a First Nation, Metis, Inuit, or Indigenous person, race, ethnicity, gender identity, sexual orientation, religion, political beliefs, social class, and/or disability. It is critical that students from diverse backgrounds and perspectives be valued in and well-served by their courses. Furthermore, the diversity that students bring to the classroom should be viewed as a resource, benefit, and source of strength for your learning experience. It is expected that all students and members of our community conduct themselves with empathy and respect for others.

Electronic Devices: During online lectures, students are not permitted to use any electronic devices other than the primary one used for attending the online lecture (e.g. laptop or desktop). Only Zoom and a note-taking application should be open during the online lecture unless an instructor advises the use of another device or application for an in-class activity. Feedback from students indicates that personal devices is the number one distraction from effective learning and participation in the online learning environment.

University Policies and Resources: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website.

Academic Integrity: The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the university policies and codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work; nor should you help others to do the same. For example, it is prohibited to: share your past assignments and answers with other students; work with other students on an assignment when an instructor has not expressly given permission; or spread information through word of mouth, social media, or other channels that subverts the fair evaluation of a class exercise, or assessment. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious

consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

Academic Freedom and Students Studying from Outside Canada: During this pandemic, the shift to online learning has greatly altered teaching and studying at UBC, including changes to health and safety considerations. Keep in mind that some UBC courses might cover topics that are censored or considered illegal by non-Canadian governments. This may include, but is not limited to, human rights, representative government, defamation, obscenity, gender or sexuality, and historical or current geopolitical controversies. If you are a student living abroad, you will be subject to the laws of your local jurisdiction, and your local authorities might limit your access to course material or take punitive action against you. UBC is strongly committed to academic freedom, but has no control over foreign authorities (please visit this web page for an articulation of the values of the University conveyed in the Senate Statement on Academic Freedom). Thus, we recognize that students will have legitimate reason to exercise caution in studying certain subjects. If you have concerns regarding your personal situation, consider postponing taking a course with manifest risks, until you are back on campus or reach out to your academic advisor to find substitute courses. For further information and support, please visit: Freedeom of Expression Web Page.

Copyright: All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline and could be subject to legal action. Any lecture recordings are for the sole use of the instructor and students enrolled in the class. In no case may the lecture recording or part of the recording be used by students for any other purpose, either personal or commercial. Further, audio or video recording of classes are not permitted without the prior consent of the instructor.

Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

Course Topics and Tentative Schedule

Session / Date		Topic
	Tue Sep 8	Informal Orientation / Q&A / Voluntary Attendance
1.	Thu Sep 10	Introduction and course overview (first class)
2.	Tue Sep 15	Environmental issues & climate change
3.	Thu Sep 17	Life-cycle analysis and environmental impact assessment
4.	Tue Sep 22	Valuation of environmental benefits and costs
5.	Thu Sep 24	Market failures and externalities: key concepts
6.	Tue Sep 29	Environmental policies: choices and trade-offs
7.	Thu Sep 1	Environmental taxes and emission permit trading
8.	Tue Oct 6	Subsidies and hybrid policies
9.	Thu Oct 8	Environmental law and transboundary policy issues
10.	Tue Oct 13	*Research Paper Presentation/Discussion*: Holland et al. (AER, 2016) Are There Environmental Benefits from Driving Electric Vehicles?
	Thu Oct 15	Midterm Exam (online via Canvas)
11.	Tue Oct 20	Economics of Renewable Resources (forests, fish, water)
12.	Thu Oct 22	Economics of Exhaustible Resources (fossil fuels)
13.	Tue Oct 27	Energy Markets Overview: Technological and Economic Choices
14.	Thu Oct 29	Renewable Energy: Technology, Economics, Policy
15.	Tue Nov 3	Electricity Economics
16.	Thu Nov 5	Energy Efficiency and the Rebound Effect
17.	Tue Nov 10	*Research Paper Presentation/Discussion*: Ito (AER, 2014) Do Consumers Respond to Marginal or Average Prices?
	Thu Nov 12	Team Presentations (1+2)
	Tue Nov 17	Team Presentations (3+4)
	Thu Nov 19	Team Presentations (5+6)
	Tue Nov 24	Team Presentations (7+8)
	Thu Nov 26	Team Presentations (9+10)
18.	Tue Dec 1	Policy Forum & Debate: Urban Environment
19.	Thu Dec 3	Wrap-up / final exam preparation / student evaluations

This schedule is tentative and subject to revisions. Please check Canvas for updates.