

PHD IN SUSTAINABLE DEVELOPMENT

Ph.D. Curriculum Overview

The distinctive and innovative nature of this program requires a core set of courses that provide an interdisciplinary grounding. Each of these courses is taught at the level expected of first- or second-year Ph.D. students in the affiliated departments. The course structure is designed to provide students with PhD-level training in economics and a natural science field, complemented by integrative courses in sustainable development designed specifically for this program and courses in social sciences. The course structure combines flexibility to pursue an individual field of study with broad-based skills and knowledge development. The core curriculum consists of around ten core courses, listed below. Students must also complete two social science electives and a coherent sequence of four natural science courses for a minimum total of 60 credits and should maintain an overall B+ average with no lower than a B- in any of the core classes. In addition to course work, students participate in integrative seminars Sustainable Development Seminar I (SDEV U9200)/Sustainable Development Seminar II (SDEV U9201) throughout the first three years of the program, and complete the MA thesis and take an Orals Exam (leading to the MPhil Degree), in addition to presenting and defending a Ph.D. dissertation.

Due to the unique interdisciplinary content of the program, students entering with a master's degree earned at Columbia University or elsewhere are still required to complete all MA and MPhil course requirements and examinations.

Advanced Standing for previously held degrees may occasionally be accorded at the discretion of the Director of Graduate Studies (DGS) after successfully completing the first year.

Advising

Students must select an advisory committee before the end of the fourth semester, ideally earlier, with the help and approval of the DGS and Program Faculty. The committee ideally comprises 2 to 3 members, one of whom is the academic advisor and must be a member of the SIPA faculty. The remaining advisors can be from other Columbia University schools and departments or from other universities. An advisor from a different university cannot be the main academic advisor. The advisory committee should include faculty whose expertise covers both the social and natural sciences.

For the first year or (at most) two academic years, the DGS will have the role of academic advisor. The role of the advisor is to guide and monitor research progress, including reporting to GSAS on the progress of the student, sitting in on Orals and Defense committees, and other associated duties.

Service Requirements

In addition to completing the requirements for the MA and the MPhil, students have to fulfill a teaching and research requirement. This entails six semesters of work as a teaching fellow (TF) or a graduate research fellow (GRF), as assigned by the director of the program. Students typically serve as TFs in SIPA master-level courses as well as a few undergraduate courses. Students who secure external fellowship funding

may reduce this requirement with the approval of the Director of Graduate Studies. Still, in all cases, every student must TA at least two semesters.

Sixth Year

The Ph.D. in sustainable development is designed and supported as a five-year program. It is recognized that some students may need to extend their studies for all or part of a sixth year. While this can be accommodated administratively, students cannot assume that funds will be available to support the sixth year of study, and they are urged to make efforts to secure fellowship support or obtain funds through their advisors or from outside sources. Sixth-year extensions may be granted as exceptions and must not be assumed.

Contact Us

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Jeffrey Sachs, Quetelet Professor of Sustainable Development; Professor of Health Policy and Management; Director of the Earth Institute

Wolfram Schlenker, Professor of International and Public Affairs

Jeffrey Shrader, Assistant Professor of International and Public Affairs

Rodrigo Soares, Lemann Professor of Brazilian Public Policy and International and Public Affairs

Joseph Stiglitz, University Professor

Requirements for the MA Degree

Sustainable Development Courses

These courses are designed and taught specifically for the PhD students in Sustainable Development, although they may be open to students from other programs.

		Points
SDEV U9200	Sustainable Development Seminar I	1.5
SDEV U9201	Sustainable Development Seminar II	1.5
SDEV U9240	Human Ecology # Sustainable Development	4
SDEV U9245	Environment # Resource Economics	3
SDEV U9248	Collective Action for Global Sustainable Development	3
SDEV U6240	Environmental Science for Sustainable Development (SDEV U6241 PhD Lab, 1 point)	3

Core Economics Courses

All core economics courses are taught in the Economics Department and are drawn from the Economics PhD syllabus. More information about these courses can be found from the [Economics department Web site](#).

		Points
ECON GR6211	MICROECONOMIC ANALYSIS I	8
- ECON GR6212	and MICROECONOMIC ANALYSIS II	
ECON GR6411	INTRODUCTION TO ECONOMETRICS I	8
- ECON GR6412	and INTRODUCTN TO ECONOMETRICS II	

A third course in Quantitative Analysis is also required

Social Science Courses

Students must take at least 3 social science courses.

Natural Sciences Courses

Students must also take 3 natural science electives drawn from the following departments:

- [Department of Ecology, Evolution, and Environmental Biology \(E3B\)](#)
- [Department of Earth and Environmental Sciences \(DEES\)](#)
- [Department of Environmental Health Sciences \(EHS\)](#) at the Mailman School of Public Health
- [Department of Earth and Environmental Engineering \(DEEE\)](#) at the Fu Foundation School of Engineering and Applied Science (SEAS)

MA Thesis

The master's thesis should be completed by May 1 in the fourth semester and should address a problem in sustainable development using data and methodologies from the four natural science courses completed in the first two years of the program. The thesis consists of an article (around 30 pages long), which would be publishable in an appropriately refereed academic journal reflecting the disciplinary orientation of the project. Students should submit the Masters paper to their research advisor(s) with a copy to the DGS. The advisor later meets with the student and submits a pass/fail grade to the Assistant DGS for processing. For titles of MA thesis projects previously completed by students in the program please see [here](#).

Requirements for the MPhil Degree

1. **Completion of the MA requirements** with a minimum of 60 credits and a B+ average.
2. **Complete 4 out of 6 semesters of service requirements** (Teaching Assistant, TA or Research Assistant, RA appointments). Students with outside funding need to complete a minimum of 2 TA appointments.
3. **Fulfillment of research tools requirement**
 - Core courses in quantitative methods (Introduction to Econometrics I and II, and a third Quantitative Analysis course).
 - Either a two-course sequence in GIS or other analytic modeling systems or a proficiency examination in a non-English language, as selected with the approval of the academic adviser.

4. **Submission of a final draft of the dissertation prospectus**, approved by the adviser, to the MPhil Examining Committee three weeks prior to the MPhil examinations. The prospectus should:
 - be a single, 10-page document
 - be distinct from the Master's thesis though it can build on similar research
 - cover the methods and objective of the research project

5. **Two-hour long oral exam** designed to examine the candidates' formal learning and their capability to do independent research, including the presentation of a dissertation prospectus/proposal. The examination committee will consist of three faculty members, normally from the Sustainable Development core faculty, and will be chaired by the Director of Graduate Studies (DGS), who will lead the discussion of the prospectus. Examinations are conducted as follows:
 - 5 minutes: the candidate will give a formal presentation of the prospectus
 - 30 minutes: all members of the examining committee, led by the DGS, will ask questions.
 - 30 minutes: examination of proficiency in fields most relevant to the proposed research, from within the following subjects:
 - Economics
 - Natural Science
 - Sustainable Development
 - (Optional) An elective field, such as study of a region

- Each component will be graded on a scale of 1 to 5, with 1 being the lowest and 5 the highest. If the average grade is 3.5 or above the student receives a clear pass. If the average grade is below 3.0 the student will be required to leave the program by the end of the current semester. If the average grade is between 3.0 and 3.5 or if any individual grade is below 3.0 the committee require the student to take further courses, revise their prospectus, or provide a revised research paper.

Requirements for the PhD Degree PhD Dissertation

The PhD dissertation will be on a social science topic in sustainable development. The social science research will be informed by an understanding of physical and natural science constraints and opportunities influencing economic development.

Students with a regional area of interest to their dissertation may wish to do research abroad, so as to conduct field studies, use archives, improve language skills, or confer with local experts. In order that students may complete the PhD program without delay, it is preferred that they make use of summers to conduct such research. Students who feel they require a longer period of field research or language training need the approval of their advisor, and of the DGS. Students may not receive extended residence credit for study or research away from Columbia before the completion of all course work requirements and comprehensive examinations.

PhD Defense

1. Complete the GSAS deposit application and pay the \$85 processing fee;
2. Submit the required Survey of Earned Doctorates online;
3. Upload and submit a PDF copy of your dissertation;
4. Obtain a signed Approval Card that certifies you have made all required revisions and that the dissertation has been approved for deposit by your sponsor and by your doctoral program.

Open defenses (optional)

If both the candidate for a defense and the Advisory Committee choose to have an “open” defense, the following will apply:

1. The candidate will have a maximum of 40 minutes to present major conclusions of the thesis research, with at least half of the time devoted to a description of new findings or insights in the field discussed that directly resulted from research by the student.
2. Any member of the University community or other interested parties can attend the first part of the thesis defense.
3. Questions following the initial presentation are permitted for a maximum of 10 minutes.
4. Following the oral presentation by the candidate and the brief period for general questions, the defense committee will question the candidate in closed session for a period of up to 90 minutes.

If either the candidate or the Advisory Committee prefer, the procedures for “closed defense” (i.e., 20-minute oral presentation followed by questions from the defense committee in closed session for a period of up to 90 minutes) will be followed.

1. Candidates must consult with their advisor and the Director of Graduate Studies about scheduling the defense. Every Ph.D. student must submit the Intent to Distribute and Defend form directly to GSAS.
2. The final examination will not be scheduled until the Director of Graduate Studies has recommended the dissertation for defense. A five-person examining committee will be appointed by the department and must be approved by GSAS. The DGS will then officially invite the examiners.
3. The Application for Defense must be completed by the Candidate and the Director of Graduate Studies and submitted by the program's office to the GSAS Dissertation office.
4. Members of the PhD examining committee must be given a minimum of three weeks to read the thesis, so the defense may comfortably be scheduled after submission of the thesis to the Advisory Committee. Before being recommended for defense, the candidate must submit to his/her Advisory Committee draft copies of the thesis, including figures, plates and tables and obtain the Advisory Committee's written approval of the draft. (Written approval by the Advisory Committee indicates only that the thesis as it stands or with revisions suggested by them is in good enough form to justify scheduling the defense.)
5. After the Advisory Committee has given its preliminary approval in writing, and the candidate has made any revisions suggested

by them, he/she must distribute copies of the dissertation to the external readers. Instructions for the correct form for preparing the manuscript and information on publication options may be obtained via the Graduate School's website (<http://www.columbia.edu/cu/gsas/>)

6. The candidate must see that outstanding fees or loans to the University are paid and make sure that he/she has fulfilled all other Departmental requirements. When these requirements have been fulfilled and the examining committee has been appointed by the DGS, the candidate is notified of the examination date, usually about two weeks in advance.
7. After passing the final examination, the candidate must see to any minor revisions and their approval by the examining committee before final deposit. If major revisions were called for (a defense-vote of “incomplete”), these must be made and submitted within a stated period (usually no fewer than three months and no longer than one year from the date of the defense) to the supervising committee, whose approval will have to be certified in writing before the candidate can be recorded as having passed the final examination. From the time of the “pass” vote, the student has a maximum of six months to deposit the thesis. There are four steps to completing your deposit – the steps can be done in any order, but your deposit is only considered complete when all four steps are done.
8. Doctorate degrees are awarded in October, February, and May. Check the academic calendar for specific deadlines for the final deposit of the dissertation. (You may, however, call yourself “Dr.” as of the day of your deposit, since that date will appear on your official transcript.)

PhD in Sustainable Development Courses

SDEV U6240 Environmental Science for Sustainable Development. 3.00 Points.

Category: EE, EPD:Sustainable

This course provides a rigorous survey of the key areas of natural science that are critical to understanding sustainable development. The course will provide the theories, methodological techniques and applications associated with each natural science unit presented. The teaching is designed to ensure that students have the natural science basis to properly appreciate the co-dependencies of natural and human systems, which are central to understanding sustainable development. Students will learn the complexities of the interaction between the natural and human environment. After completing the course, students should be able to incorporate scholarly scientific work into their research or policy decisions and be able to use scientific methods of data analysis. This is a modular course that will cover core thematic areas specifically, climate, natural hazards, water management, public health/epidemiology, and ecology/biodiversity. To achieve coherence across lectures this course will emphasize how each topic is critical to studies of sustainable development and place-based case studies in recitation will integrate various topics covered. In the lectures and particularly the recitation sections this course will emphasize key scientific concepts such as uncertainty, experimental versus observational approaches, prediction and predictability, the use of models and other essential methodological aspects

Term	Section	Call Number	Instructor	Times/Location
Fall 2023	001	18038	John Mutter	T 11:00am - 12:50pm 501a International Affairs Bldg
Fall 2023	R01	17349		Th 4:10pm - 6:00pm 418 International Affairs Bldg

SDEV U9200 Sustainable Development Seminar I. 1.50 Point.

This course is restricted to PhD in Sustainable Development

Term	Section	Call Number	Instructor	Times/Location
Fall 2023	001	17354	Douglas Almond	M 4:10pm - 6:00pm 801 International Affairs Bldg
Fall 2023	R01	18039		F 10:00am - 11:30am Othr Other

SDEV U9201 Sustainable Development Seminar II. 1.50 Point.

This course is restricted to PhD in Sustainable Development

Term	Section	Call Number	Instructor	Times/Location
Spring 2024	001	10340	Douglas Almond	M 4:10pm - 6:00pm 402 International Affairs Bldg
Spring 2024	R01	10341		F 10:00am - 11:30am 1102 International Affairs Bldg

SDEV U9240 Human Ecology # Sustainable Development. 4.00 Points.

Category: EPD:Sustainable, PhD in Sustainable Development

Open to PhD Students Only

This course has two primary objectives: first, to provide a structured way to think about—and conduct research in—the field of sustainable development. Second, to introduce formal models of dynamic, coupled human and environmental systems

Term	Section	Call Number	Instructor	Times/Location
Spring 2024	001	10342	Jeffrey Shrader	M 2:10pm - 4:00pm 501a International Affairs Bldg
Spring 2024	R01	20973		F 1:00pm - 3:00pm 501b International Affairs Bldg

SDEV U9245 Environment # Resource Economics. 3.00 Points.

This course aims to introduce you to the basic concepts of environmental economics

Term	Section	Call Number	Instructor	Times/Location
Fall 2023	001	17961	Wolfram Schlenker	Th 2:10pm - 4:00pm 823 International Affairs Bldg

SDEV U9248 Collective Action for Global Sustainable Development. 3.00 Points.

Category: PhD in Sustainable Development

Registration restricted to PhD Students

When externalities go uncorrected, and public goods go undersupplied, the reason is not that the market fails; the reason is that governments are unable or unwilling to intervene effectively. The biggest problem is with transnational externalities and regional and global public goods. This is partly because of the scale of these problems, but it is also because the institutional arrangements at this level make effective intervention difficult. There is no World Government. Instead, there are around 200 sovereign states. To support sustainable development globally, states must cooperate, and yet states' self-interests often conflict with their collective interests. This is why all countries agree that collective action must be taken to limit climate change, and yet, though they try and try again, countries seem unable to muster the individual action needed to meet their own collective goal. The aim of this course is to develop an apparatus for understanding international collective action for sustainable development. By an apparatus, I mean a theory, a structured way of looking at and understanding the world. Rather than just present the theory, my aim is to show you why theory is needed, how it has been constructed, and what its strengths and weaknesses are. Basically, in addition to teaching you principles and tools, I want you to come to see how this field has developed, what it has achieved, and where it has fallen short. Throughout the course, we shall also be looking at tests and applications of the theory-empirical and experimental papers in addition to case studies. The course draws from a number of disciplines, especially economics, game theory (analytical and experimental), and international relations-but also international law, philosophy, history, the natural and physical sciences, and engineering. The focus will be on institutions, and the way that they restructure the relations among states to cause states to behave differently-that is, to cause them to undertake collective action. In terms of applications, the course will address not only climate change but also depletion of the ozone layer, trans-boundary air pollution, pollution of the oceans, over-fishing, biodiversity loss, and the emergence and spread of infectious diseases

Term	Section	Call Number	Instructor	Times/Location
Spring 2024	001	10343	Scott Barrett	T 2:10pm - 4:00pm 501 a International Affairs Bldg

ECON GR6211 MICROECONOMIC ANALYSIS I. 4.00 points.

Prerequisites: the director of graduate studies' permission. Corequisites: ECON G6410. Consumer and producer behavior; general competitive equilibrium, welfare and efficiency, behavior under uncertainty, intertemporal allocation and capital theory, imperfect competition, elements of game theory, problems of information, economies with price rigidities

Fall 2023: ECON GR6211

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
ECON 6211	001/11537	T Th 2:40pm - 3:55pm 214 Pupin Laboratories	Pierre-Andre Chiappori, Mark Dean	4.00	38/50

ECON GR6212 MICROECONOMIC ANALYSIS II. 4.00 points.

Prerequisites: the director of graduate studies permission. Corequisites: ECON G6410. Consumer and producer behavior; general competitive equilibrium, welfare and efficiency, behavior under uncertainty, intertemporal allocation and capital theory, imperfect competition, elements of game theory, problems of information, economies with price rigidities

Spring 2024: ECON GR6212

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
ECON 6212	001/12002	M W 10:10am - 11:25am 520 Mathematics Building	Qingmin Liu, Yeon-Koo Che	4.00	37/45

ECON GR6411 INTRODUCTION TO ECONOMETRICS I. 4.00 points.

Corequisites: ECON G6410 and the director of graduate studies' permission. Introduction to probability theory and statistical inference

Fall 2023: ECON GR6411

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
ECON 6411	001/11543	M W 1:10pm - 2:25pm 520 Mathematics Building	Serena Ng, Jushan Bai	4.00	37/45

ECON GR6412 INTRODUCTN TO ECONOMETRICS II. 4.00 points.

Corequisites: ECON G6410 and the director of graduate studies permission. Introduction to the general linear model and its use in econometrics, including the consequences of departures from the standard assumptions

Spring 2024: ECON GR6412

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
ECON 6412	001/12009	T Th 8:40am - 9:55am 627 Seeley W. Mudd Building	Jushan Bai, Simon Lee	4.00	37/45