

Major and Minor in Global Environmental Change and Sustainability (GECS)

Department of Earth and Planetary Sciences
Johns Hopkins University
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Overview

The interdisciplinary, interdepartmental GECS major and minor introduce students to both the science of the Earth and its living and nonliving systems and how humans interact with Earth and its natural systems. GECS is also solution-focused on how humans can use powerful tools, such as policy and communication to help those systems. The goals are to advance awareness of the magnitude and consequences of these issues and to train the next generation of problem-solvers to address the effects of global environmental change. Students' backgrounds are typically specialized within traditional disciplines; a primary purpose of this major is to develop the ability of students to venture beyond the confines of those disciplines. Students will be exposed to theory, research, and the practical applications of both throughout their coursework.

Curriculum for Major

The GECS core requirements provide all majors with a solid background in the study of both the environmental science and social science of our changing world. After completing the core requirements, students will choose either the Environmental Science or Social Science concentration for more in-depth study in their area of greater interest. While allowing students to concentrate, however, both concentrations will continue to require some courses in both environmental science and social science; the proportion will depend on the concentration.

A key component of the GECS major is the Senior Capstone Experience, which includes the research, planning and execution of a sustainability project.

To further enhance the students' perspective of the global nature of the issues and differences in world views of different cultures, the major will cultivate and nurture relationships with international institutions to provide a variety of culturally and academically challenging opportunities abroad to augment the JHU experience.

Course Requirements:

Requirements for the major include a total of 24 courses (81 credits) if the Science Concentration is chosen, or 25 courses (78 credits) if the Social Science Concentration is chosen. Students must also complete 6 additional Humanities (H) credits to fulfill the University's distribution requirements. Relevant courses completed to fulfill these additional distribution requirements can also count towards the GECS major. Several GECS courses in Table 1 (e.g. all of the Communications requirement courses) and Table 4 can be taken as electives to fulfill this requirement.

Courses that fulfill the GECS requirements can be selected from a diversity of offerings available from different departments. GECS majors take a "core" of 13 foundational courses listed in Table 1. Core courses are offered through Earth & Planetary Sciences, Mathematics,

Economics, Chemistry, Engineering, and Political Science. For electives, the major draws upon additional pertinent course offerings from these departments as well as from Anthropology, Biology, Physics, and History. Economics, Sociology, and Political Science are especially relevant to global environmental change and sustainability, both in their contributions to the problems we face and in their potential contributions to solutions to achieving sustainability. GECS is fortunate to have many courses from these disciplines with vitally relevant content. As such, these three disciplines contribute the majority of the Social Science Elective courses.

1. Core courses: 13 core courses required for all GECS majors are listed in Table 1.
2. Environmental Science Concentration core courses are listed in Table 2. In addition to these core courses, students choosing this concentration must take an additional 2 upper-level (300 level or above) courses from Table 3: Major Electives in Earth and Environmental Science, and 4 courses from Table 4: Major Electives in Social Sciences, 2 of which must be upper-level.
3. Social Science Concentration majors must take 2 courses from Table 3: Major Electives in Earth and Environmental Science, at least 1 of which must be upper-level, and 10 courses from Table 4: Major Electives in Social Sciences, at least 6 of which must be upper level.
4. Because GECS is inherently interdisciplinary, students fulfill the vast majority of the University's distribution requirements by completing the requirements for the major. Students must only complete 6 additional H credits to fulfill the University's distribution requirements. Relevant courses completed to fulfill these additional distribution requirements can also count towards the GECS major. Several GECS courses in Table 1 (e.g. all of the Communications requirement courses) and Table 4 can be taken as electives to fulfill this requirement.
5. Courses within the major cannot be double-counted. For example, a course chosen to fulfill a requirement from Table 1 or 2 cannot also be used as a Table 3 or 4 elective.
6. Capstone Experience

The GECS Senior Capstone Experience involves the research, planning and execution of a *tangible* sustainability project on or off-campus. The Capstone Experience provides the academic space, time, and mentoring for the student to integrate and synthesize the knowledge and skills obtained during the previous 3 years into a coherent framework in preparation for life after graduation.

While working in groups (the size of which will depend on the nature and scale of the project), GECS Seniors will research, design and create/implement a sustainability project or initiative on campus or in Baltimore.

All GECS Seniors enroll in the Capstone Seminar both in the Fall and in the Spring semesters. Prerequisites include current status as a GECS Major, completion of all core courses, and an acceptable plan for completing all requirements for the major by the end of the Senior year, or approval of the Director. The seminars are designed to

facilitate measured progress on the capstone projects and ensure that the final product is meaningful and exceptional. All majors will make an oral presentation of their capstone experience to involved faculty, advisors, and fellow students at the end of their Senior year, in addition to a poster presentation for display at the annual Undergraduate Research Day and during commencement week.

Honors Program:

Majors who complete their 4 years with a GPA of 3.5 or above in their GECS courses and receive an “A” on their Capstone Product, will receive a B.A. in GECS with Honors.

To notify the university that you are eligible for honors you must:

- 1) Obtain an honors checklist by either downloading it from www.advising.jhu.edu or by picking one up in the Office of Academic Advising.
- 2) Complete the checklist between **February 1 and March 1** of your senior year and take it to Dr. Cindy Parker for review and signature.
- 3) Return the signed checklist to the Office of Academic Advising by April 1. You do not need to make an appointment to return the checklist, but it must be signed by Dr. Parker or it will not be processed.

Table 1: Required Courses for all GECS Majors:

Course Number	Course Title	Credits, fulfills Humanities distribution requirement (H), prerequisites[§]
271.103	Intro. to Global Environmental Change	3
271.107	Introduction to Sustainability	3
030.101/105	Chemistry I + lab	3 + 1
110.106/108	Calculus I	4
180.102	Microeconomics	3
271.506	GECS Senior Capstone Seminar Part I	3, All GECS core courses completed
271.505	GECS Senior Capstone Seminar Part II	3, All GECS core courses completed
Choose 1 of:		
550.111	Statistical Analysis I	4
550.113	Statistics Through Case Study	4.5
280.345	Biostatistics in Public Health	4, 3 yrs high school math
230.205	Introduction to Social Statistics	4
Choose 2 of:		
190.102	Intro Comparative Politics	3
190.209	Contemporary International Politics	3
190.213	International Politics	3
190.226	Global Governance	3
190.206	Global Environmental Politics	3
190.301	Global Political Economy	3, 190.209
Choose 2 of:		
270.305	Energy Resources in the Modern World	3, 271.103, 271.107, or 270.220
271.308	Population and Community Ecology	3, 271.103, or Instructor's permission
271.360	Climate: Science & Policy	3, 271.103, or Instructor's permission
280.335	The Environment & Health	3
Choose 1 of:		
271.120	Environmental Photojournalism	3, H
271.302	Nature, Baltimore and a Sense of Place	3, H
271.401	Environmental Ethics	3, H

§ The Humanities distribution requirement designation and prerequisites are listed for your convenience only and may change without warning. Always consult the online course catalog and/or instructor for up-to-date information.

Environmental Science Concentration

- Core Courses as listed in **Table 2** below
- 2 upper-level courses from **Table 3: Major Electives in Earth and Environmental Science**
- 4 courses from **Table 4: Major Electives in Social Sciences**, 2 of which must be upper-level

Table 2: Environmental Science Concentration Core Courses

Course	Course Title	Credits, prerequisites[§]
110.107/9	Calculus II	4
030.102 + .106	Chemistry II + lab	4
Choose 1 of:		
250.205	Intro to Computing	3
270.205	Intro to GIS	3
270.307	Geoscience Modeling	4, Linear algebra, Stats, Physics, + Calc I, or 250.205, or permission of Instructor
270.318	Remote Sensing of the Environment	3, 250.205, or permission of Instructor
Choose 1 year of either Physics or Biology:		
171.101/103	Physics I + lab	5
171.102/104	Physics II + lab	5
020.151 +.153	Biology I + lab	4 + 1
020.152 +.154	Biology II + lab	4 + 1

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Social Science Concentration

- 2 courses from **Table 3: Earth and Environmental Science Electives**; at least 1 must be upper level
- 10 courses from **Table 4: Social Science Electives**; at least 6 must be upper level

Table 3: GECS Electives in Earth and Environmental Science^{}**

Course	Course Title	Credits, prerequisites[§]
250.205	Intro to Computing	3
270.104	History of the Earth and Its Biota	3
270.205	Intro to Geographic Information Systems (GIS) and Geospatial Analysis	3
270.224*	Oceans and Atmospheres	3, 270.103 or Instructor's permission
270.210	Environmental Field Methods	3
270.220	The Dynamic Earth: An Introduction to Geology	3, 030.101 or 171.101-102
270.221	The Dynamic Earth Laboratory	1, co-req 270.220
270.305	Energy Resources in the Modern World	3, 271.103, 271.107, or 270.220
270.307	Geoscience Modeling	4, Linear algebra, Stats, Physics, + Calc I, or 250.205, or Instructor's permission
270.311	Geobiology	3, 270.220, or Instructor's permission
270.315	Natural Catastrophes	3, Calc I and II, Physics I and II, 270.103 or 270.220, or Instructor's permission
270.318	Remote Sensing of the Environment	3, 250.205, or Instructor's permission
270.332	Soil Ecology	3, 270.308, or Instructor's permission
270.369	Geochemistry of Earth and Environment	3, 271.103, 270.220
270.377	Climates of the Past	3, 270.220, or Instructor's permission
270.378	Present and Future Climate	3, Calc I & II, Phys I & II, or Instructor's permission
270.405	Modeling the Hydrological Cycle	3, 570.353
270.308	Population and Community Ecology	3, 271.103 or Instructor's permission
271.360	Climate Change: Science and Policy	3, 271.103, or Instructor's permissions
280.335	Environment and Health	3
570.108	Introduction to Environmental Engineering	3
570.205 or 570.403	Ecology	3
570.239	Current/Emerging Environmental Issues	3, Chem II
570.328	Geography and Ecology of Plants	3
570.353	Hydrology	3, diff equations, fluid mech
570.395	Principles of Estuarine Environment: The Chesapeake Bay	3
570.411	Engineering Microbiology	4

570.443	Aquatic Chemistry	3, 1 yr each chem & calc.
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*** Three of these courses, from Table 3 or Table 4, can be used to satisfy requirements for the MSc in Environmental Sciences and Policy.**

Table 4: GECS Electives in Social Sciences[#]

Course	Course Title	Credits, prerequisites^S
070.132	Invitation to Anthropology	3, H
070.219	Anthropology and Public Action	3
070.265	Anthropology of Media	3
070.279	Ecological Anthropology	3, H
070.285/570.285	Understanding Aid	3, H
070.327	Poverty's Life: Anthropologies of Health and Economy	3, H
130.177	World Prehistory	3, H
140.302	Rise of Modern Science	3, H
140.311	Ecology, Health and the Environment	3, H
180.101	Elements of Macroeconomics	3
180.201	Behavioral Finance	3, 180.102
180.228	Economic Development	3, 180.101-102
180.241	International Trade	3, 180.101-102
180.252	Economics of Discrimination	3, 180.102
180.266	Financial Markets and Institutions	3
180.301	Microeconomic Theory	4.5, 180.101-102 OK if concurrent with 180.102, Calculus 110.106 or permission of Instructor
180.302	Macroeconomic Theory	4.5, same as above
180.355	Economics of Poverty and Inequality	3, 180.301
190.102	Introduction to Comparative Politics	3
190.209	Contemporary International Politics	3
190.220	Global Security Politics	3
190.226	Global Governance	3
190.227	U.S. Foreign Policy	3
190.280	Political Persuasion	3
190.281	Virtue, Labor and Power	3
190.301	Global Political Economy	3
190.320	Politics of East Asia	3
190.396	Capitalism and Ecology	3
190.405	Food Politics	3
190.411	Environment and Development in the Third World	3
190.477 and 195.478	Intro to Urban Policy and Urban Policy Internship	3
190.412	Political Violence	3
190.426	Science and Expertise in Global Politics	3
190.442	Civil Society	3, Instructor's permission
190.491	Game Theory in the Social Sciences	3
200.101	Introduction to Psychology	3
200.133	Introduction to Social Psychology	3
200.222	Positive Psychology	3

220.206	Becoming a Science Journalist	3, H
220.210	Introduction to Non-Fiction: Science as a Social Activity	3, H
220.317	Writing about Science II	3, H
230.101	Introduction Sociology	3
230.150	Issues in International Development	3
230.213	Social Theory	3
230.221	Global Social Change	3
230.265	Research Tools and Technologies for the Social Sciences	3
230.313	Space, Place, Poverty, and Race: Sociological Perspectives on Neighborhoods and Public Housing	3
230.325	Global Social Change and Development Practicum	3
230.359	Research Seminar on Global Social Protest	3
230.373	Urban Sociology	3
230.396	Politics and Society	3
230.460	Research Seminar on Stratification in the Modern World Economy: 1600-2014	3, 230.150 and 230.265 or Instructor's Permission
271.120	Environmental Photojournalism	3, H
271.301	Climate Change Adaptation in the Developing World	3
271.302	Nature, Baltimore and a Sense of Place	3, H
271.303	Climate Change Adaptation in the Developing World: Field Experience	3, 271.301
271.304	Sustainable Food Systems	4
271.309	Designing Sustainable Wellness	3
271.401	Environmental Ethics	3, H
271.402	Water, Energy, and Food	3
271.403*	Environmental Policymaking and Policy Analysis	3
280.215	Understanding Behavior Change: Theory and Application	3
280.225	Population, Health and Development	3
280.329	The Good, the Bad and the Ugly: Scientific Literature	3, 280.350 and 280.345
280.380	Global Health Principles and Practices	3
360.247	Introduction to Social Policy: Baltimore and Beyond	3
420.656*	Environment Impact Assessment and Decision Methods	3, 270.403
570.109	Environment and Society: Towards Sustainability	3
570.110	Intro to Engineering for Sustainable Development	3
570.130	Climate, Environment and Society	3, H

570.222	Environment and Society	3, H
570.334	Engineering Microeconomics	3, Calc I and II. or Instructor's permission
570.406	Environmental History	3
570.428	Problems in Applied Economics	3, Instructor permission required
570.493	Economic Foundations for Environmental Engineering and Policy Design	3, 180.101-102 and Calc III or equivalents
570.495	Organizational Foundations for Environmental Engineering and Policy Design	3, Calc I and II
570.496	Urban and Environmental Systems	3, 570.305 and 570.495 OR linear programming
570.497	Risk and Decision Analysis	3, Intro Stats and Probability

The lists of acceptable Earth and Environmental Science and Social Science Electives will be reviewed and updated annually by the Director, with guidance from the Advisory Committee. Courses no longer taught will be removed, although credit earned for courses that are removed will still count toward GECS major requirements as long as the course was on the list when it was taken, and new courses will be added. Relevant courses not included in the elective list may be able to be substituted for an elective with approval of the Director. Students wishing to make such a substitution should follow the procedure outlined [here](#).

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*** Three of these courses, from Table 3 or Table 4, can be used to satisfy requirements for the MSc in Environmental Sciences and Policy.**

Curriculum for Minor

The GECS minor consists of seven courses (Table 5). All minors are required to take two core courses: Intro to Global Environmental Change provides the necessary content about the science of the Earth and its environments and Intro to Sustainability covers a thorough overview of the interactions between humans and the Earth's systems and how those interactions could become sustainable. Students then have a choice of one of three other science courses that further explores a subset of interactions of humans with Earth's living and nonliving systems, depending on the student's area of interest. Students must choose two more courses from the list of Earth and Environmental Science Electives (Table 3) and two more courses from the list of Social Science Electives (Table 4). At least one course from each elective list must be upper level. A total of five Earth and Environmental Science courses provide the science basis of the minor, which is then rounded out with two relevant Social Science courses. Because students will be acquiring the methodological tools of their major discipline, this curriculum removes the science methodology required in the GECS major, while keeping the most important core content.

Table 5: Required Courses for GECS Minor

Course Number	Course Title	Credits, prerequisites [§]
271.103	Intro. to Global Environmental Change	3
271.107	Introduction to Sustainability	3
Choose 1 of:		
270.305	Energy Resources in the Modern World	3, 271.103, 271.107, or 270.220
271.308	Population and Community Ecology	3, 270.103 or Instructor's permission
271.360	Climate: Science & Policy	3, 270.103, or Instructor's permission
280.335	The Environment & Health	3

§ Prerequisites are listed for your convenience only and may change without warning. Always consult the online catalog and/or instructor for current prerequisites.

- 2 courses from **Table 3: Earth and Environmental Science Electives**; at least 1 must be upper level
- 2 courses from **Table 4: Social Science Electives**; at least 1 must be upper level

For more information contact:

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