

Geographical and Sustainability Sciences

Chair

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Undergraduate majors: geography (BA, BS); sustainability science (BS)

Undergraduate minors: geographic information science; geography

Undergraduate certificate: geographic information science

Graduate degrees: MA in geography; PhD in geography

Faculty: <https://geography.uiowa.edu/people/faculty>

Website: <https://geography.uiowa.edu/>

Courses

- Geography Courses [p. 1]
- Sustainability Science Courses [p. 5]

Geography Courses

GEOG:1000 First-Year Seminar 1 s.h.

Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities). Requirements: first- or second-semester standing.

GEOG:1020 The Global Environment 3 s.h.

Underlying processes driving human/environment interaction, including climate change, deforestation, and natural disasters; environmental challenges, including declining biological diversity; human response to more frequent severe climate events; production of a more sustainable future. GE: Sustainability. GE: Natural Sciences without Lab.

GEOG:1021 The Global Environment Lab 1 s.h.

Laboratory application of concepts discussed in GEOG:1020; computer-based and traditional approaches to the investigation of earth's processes, including earthquakes, water and energy balances, climate and weather, and soil development. Corequisites: GEOG:1020, if not taken as a prerequisite. GE: Natural Sciences Lab only.

GEOG:1030 Our Digital Earth 3 s.h.

Gain experience working with geospatial technology, such as geographic information systems (GIS) and remote sensing, using geospatial data and analysis to illuminate and improve sustainability issues that face current and future generations. GE: Sustainability. GE: Quantitative or Formal Reasoning.

GEOG:1046 Environmental Politics in India 3 s.h.

How resources, commodities, people, and ideas cross borders; examination of globalization through issues of technology, social justice, environment; perspectives from anthropology, gender studies, geography, energy science, and development. GE: Sustainability. GE: International and Global Issues. Same as ANTH:1046, GWSS:1046, SJUS:1046.

GEOG:1070 Contemporary Environmental Issues 3 s.h.

Global environmental challenges; ecological, economical, cultural, and geographical causes and effects; underlying science and potential solutions to global issues of sustainability. GE: Sustainability. GE: International and Global Issues.

GEOG:1090 Globalization and Geographic Diversity 3 s.h.

World regions including their physical environment, culture, economy, politics, and relationships with other regions; students learn about conflicts within and between regions. GE: International and Global Issues; Social Sciences.

GEOG:1095 The Quest for Location: Historical Developments in Cartographic Science and Technology 3 s.h.

Development of the science and technology of cartography as embedded in particular places and contexts; topics include determination of latitude and longitude, map projections, navigation, military mapping, surveying and taxation, printing technologies, remote sensing, and global positioning.

GEOG:1115 The History of Oil 3 s.h.

Historical perspective on business, science, geology, technology, politics, environment, and culture of the global oil industry; the rise of oil as the most influential international business of the last 150 years, the material foundation of economies, a major force in world politics, a shaper of daily life, and a guide to understanding Earth's deep history. Offered fall semesters. GE: Sustainability. GE: Historical Perspectives. Same as EES:1115, ENVS:1115, HIST:1115.

GEOG:2010 Interdisciplinary Environmental Seminar 1 s.h.

Discover research, explore careers, and build connections. Requirements: first- or second-year standing. Same as EES:2010, ENVS:2010.

GEOG:2013 Introduction to Sustainability 3 s.h.

Introduction to sustainability knowledge, skills, and habits as a means to shape one's vision of a sustainable citizen; emphasis on basic skills of literacy, applied math, and finding information; traditional sustainability knowledge areas related to society, economy, and environment; intersecting themes (e.g., informed consumerism, eco-economics, and livable environments). GE: Sustainability. GE: Social Sciences. Same as BUS:2013, SUST:2013, URP:2013.

GEOG:2050 Foundations of GIS 4 s.h.

Introduction to concepts and methods of geographical information systems (GIS) technology through hands-on lab activities and projects; introduction to map design and spatial analysis.

GEOG:2110 Eight Billion and Counting: Introduction to Population Dynamics 3 s.h.

How dramatic changes to the size of population has changed fundamental characteristics of populations and processes, such as food and water scarcity, climate change and biodiversity, rise of megacities, health and disease, migration, social networks, economics, environment, and household structure. GE: Social Sciences. Same as GHS:2110.

- GEOG:2310 Introduction to Climatology** 3 s.h.
Introduction to atmospheric processes that determine weather and climate; flow of energy through the atmosphere, distribution and movement of moisture and air, and atmospheric disturbances such as cyclones, hurricanes and tornadoes, and climate change. Recommendations: GEOG:1020 or similar earth systems science course. Same as EES:2310.
- GEOG:2374 Biogeography** 3 s.h.
Introduction to processes that lead to the patterns of plant and animal distributions we see across the globe; processes of focus include plate tectonics, climate, and human-ecological interactions; species management and conservation in relationship to climate and change in human patterns of environment. Prerequisites: BIOL:1141 or BIOL:1370 or BIOL:1261 or GEOG:1020 or BIOL:1412. Same as BIOL:2374.
- GEOG:2910 The Global Economy** 3 s.h.
Examination of contemporary economic geography; types of national economies, uneven development, role of government in shaping economy, multinational corporations; foundation for understanding national economies and economic statistics; contemporary issues including economic globalization, commodification of nature, de-industrialization. GE: International and Global Issues; Social Sciences.
- GEOG:2930 Water Resources** 3 s.h.
Introduction to science and policy issues affecting water resources management in the U.S.; how the intersection of people, climate, technology, and geography affects the quality, availability, and demand for freshwater resources.
- GEOG:2950 Environmental Conservation** 4 s.h.
Scientific foundations of biological conservation; strategies used to better connect conservation practice with needs of a growing human population. Prerequisites: EES:1080 or GEOG:1020 or GEOG:1070.
- GEOG:2990 Readings for Undergraduates** arr.
Supervised readings in geography.
- GEOG:3001 Special Topics** arr.
Contemporary fields of inquiry, such as biophysical systems, GIS, locational analysis, water resources, economic geography, demographic analysis, environment, urbanization, transportation, and regional development.
- GEOG:3003 Interdisciplinary Environmental Seminar** 1 s.h.
Role of sciences in environmental issues and problems; progression from observation to evaluation to design of better questions and experiments. Requirements: third- or fourth-year standing. Same as EES:3010, ENVS:3010.
- GEOG:3020 Earth Surface Processes** 3 s.h.
Basic geomorphic and environmental processes that shape the earth's surface; emphasis on erosion, transport, deposition by land mass movement (creep, landslides, earth flow), fluid agents (wind, water, ice); methods used to study these processes. Recommendations: EES:1050 or EES:1080 or ENVS:1080 or GEOG:1020 or EES:1085 or ENVS:1085. Same as EES:3020, ENVS:3020.
- GEOG:3050 Geospatial Programming** 3 s.h.
Introduction to geospatial programming with Python; programming basics, data structures, and algorithms; spatial data models and structures; vector-based and raster-based geoprocessing; automating GIS tasks and models; spatial libraries (e.g., ArcPy, GeoPandas, GDAL, PySAL). Prerequisites: GEOG:2050. Same as IGPI:3050.
- GEOG:3070 Hungry Planet: Global Geographies of Food** 3 s.h.
Societal and environmental implications of past, current, and future global food supply examined from a geographical perspective; focus on questions of who eats what, where, and why; transformative history of agriculture, modern agribusiness and alternative food supplies, geopolitical implications of food production, food scarcity and rising food costs, urban versus rural agriculture, the obesity epidemic versus malnutrition, and the future of food. Same as GHS:3070.
- GEOG:3110 Geography of Health** 3 s.h.
Provision of health care in selected countries, with particular reference to the Third World; focus on problems of geographical, economic, cultural accessibility to health services; disease ecology, prospective payment systems, privatization, medical pluralism. Same as GHS:3111.
- GEOG:3131 Unnatural Disasters: A Global History** 3 s.h.
What is a natural disaster? How do we assess "naturalness" of these events within political, social, and historical contexts in which they occur? Are disasters specific moments of crisis, or rather, are they slow—unraveling across time and space years before and after the moment their pain is most acutely felt? Examination of these questions at a global scale. Same as HIST:3131.
- GEOG:3210 Health, Work, and the Environment** 3 s.h.
Survey of environmental and occupational health hazards and the associated health risks of exposure; how public health protects society from these hazards; how public health policy can be influenced by science. Same as CPH:3400.
- GEOG:3300 Envisioning Future Worlds: Sustainable Development and Its Alternatives** 3 s.h.
Sociocultural, geopolitical, and environmental implications of sustainable development and its alternatives investigated from a geographic perspective; geopolitical history of sustainable development; measures of sustainability in development; major critiques of sustainable development; alternative visions of development from different geographical contexts including ecofeminism, Buen Vivir, food sovereignty, degrowth, commoning, and the People's Health Movement. Same as GHS:3300.
- GEOG:3315 Ecosystem Ecology** 3 s.h.
Terrestrial ecosystems as integrators of biological, physical, and ecological processes; flows of energy, carbon, water, and nutrients within ecosystems; spatial and temporal patterns and processes of Earth's ecosystems; sustaining ecosystems in the face of global change. Prerequisites: GEOG:2374 or BIOL:2374 or BIOL:2673 or GEOG:1020 or EES:1080.
- GEOG:3331 Human Dimensions of Climate** 3 s.h.
How climate shapes human societies; focus on how climate and climate variability affects food production, water use, energy use, and human disease systems (e.g., influenza, malaria, air pollution, diarrheal disease); climate change impacts (e.g., sea level rise, droughts, wildfires, famine); societal impact, adaptation and vulnerability, mitigation strategies; policy.

- GEOG:3340 Ecosystem Services** 3 s.h.
Ecosystem services—valuable goods and services produced by ecosystems (e.g., flood control, food production, water purification)—from an interdisciplinary perspective centering on geographic techniques used to measure, map, and model ecosystem services; methods used to incorporate ecosystem services into decision and policy making; how human activities alter these services. Prerequisites: GEOG:2050 and (GEOG:2374 or EES:1080 or BIOL:2673 or BIOL:1370 or GEOG:1070 or GEOG:1020).
- GEOG:3350 Urban Ecology** 3 s.h.
Urban ecology as an interdisciplinary field that investigates relationships between natural and the systems in urban environments; students explore urban ecosystems through lecture, discussion of current research, and field-based research projects; and identify how cities can become more sustainable systems. Prerequisites: BIOL:2673 or GEOG:2374. Requirements: GEOG:2374 or ENVS:2673 or introductory course in ecology, and junior standing.
- GEOG:3360 Soil Genesis and Geomorphology** 3 s.h.
Introduction to soil genesis, soil geomorphology, and classification including the basics of soil profile description and soil-landscape, soil-vegetation, and soil-climate relationships; emphasis on study of soils as the interface between living and non-living Earth systems and the role of soils in sustaining ecosystems and human societies; short field excursions and a weekend field trip. Requirements: college earth science and chemistry. Same as EES:3360.
- GEOG:3400 Iowa Environmental Policy in Practice** 3 s.h.
How Iowa government addresses environmental policy development and implementation; policy process and current environmental issues; students attend meetings with Iowa State legislators and relevant agency personnel in Des Moines, Iowa, to observe how policies move into practice in agency offices. Prerequisites: GEOG:1070 or POLI:3111 or GEOG:3780. Requirements: junior or higher standing.
- GEOG:3420 Sustainable and Green Building Concepts** 3 s.h.
Green building and sustainable development trends and theories: water policy, ecosystem services, climate change, and public health; LEED certified building process and each of the associated credit categories (i.e., sustainable sites, energy and atmosphere, water efficiency); how knowledge of green building and sustainable development can help lessen the environmental impact of built environments, improve the bottom line, and better plan for great communities.
- GEOG:3500 Introduction to Environmental Remote Sensing** 3 s.h.
Basic concepts and principles of remote sensing; sources of data; georegistration; digital processing and classification of remotely sensed images for extraction of environmental information; linkage of remote sensing techniques with GIS analysis. Same as IGPI:3500.
- GEOG:3520 GIS for Environmental Studies** 3 s.h.
Students learn new, more advanced techniques for the representation and study of human and natural systems using geographic information systems (GIS); application of this new knowledge to environmental management and problem solving. Prerequisites: GEOG:2050. Same as IGPI:3520.
- GEOG:3539 History of Environmental (In)Justice in Latin America** 3 s.h.
Introduction to history of environmental change in Latin America; examination of pre-Hispanic cultures and spaces; reshaping of landscapes due to colonialism; commodification of nature in early republics; consolidation of 19th-century agro-economies; land-tenure changes and integration of regional markets due to neoliberalism in 20th century; relationship between environmental problems (e.g., biotic invasions, soil exhaustion, biodiversity loss, pesticide contamination) and imperial domination; scientific racism, state formation, and income inequality. Same as HIST:3539.
- GEOG:3540 Geographic Visualization** 3 s.h.
Concepts and techniques that underlie cartographic representation, interaction, and geovisualization; map symbolization and visual variables; spatiotemporal visualization, multivariate mapping, interactive cartography, animation, geovisual analytics, 3D visualization, virtual and augmented reality. Prerequisites: GEOG:2050. Same as IGPI:3540.
- GEOG:3570 Light Detection and Ranging (LiDAR): Principles and Applications** 3 s.h.
Basic principles and applications of Light Detection and Ranging (LiDAR); LiDAR as an essential technology for mapping and analyzing a vast range of topics, including hydrology flooding, transportation planning, and 3D modeling. Recommendations: GEOG:2050.
- GEOG:3610 Ethical Collection and Use of Geospatial Information** 3 s.h.
Ethical issues that arise during the collection and use of digital geospatial information; particular emphasis on privacy as well as willful and unintentional introduction of different types of errors of omission (e.g., sampling related errors) and commission (e.g., inappropriate map projections); readings provide theoretical background and illustrative practical examples.
- GEOG:3760 Hazards and Society** 3 s.h.
Examination of the impact and societal responses to natural and technological hazards; using case studies from around the world, students explore relationships between extreme events, human behavior, disaster management, public policy, and technology to understand what makes people and places vulnerable to hazards. Same as GHS:3760.
- GEOG:3780 U.S. Energy Policy in Global Context** 3 s.h.
Historical and contemporary aspects of U.S. governmental planning and policy on a wide range of energy issues in global context. Same as GHS:3780, HIST:3240, POLI:3431.
- GEOG:3800 Environmental Policy** 3 s.h.
Reasons why markets fail in environmental realm (e.g., externalities, common pool resources, club goods, public goods); ecosystem services and techniques used for their valuation; revealed and stated preferences; cost-benefit analysis and role in policy-making process; tools to address environmental market failures, particularly command and control, taxes and subsidies, and mitigation markets; focus on air pollution, climate change, and water-related policies.
- GEOG:3920 Planning Livable Cities** 3 s.h.
Development of livable cities in the United States; economic, physical, environmental, and political forces that shape their growth; impact of planning, how it shapes the future of cities. Same as URP:3001.

- GEOG:3940 Transportation Economics** 3 s.h.
Overview of transportation markets—intercity, rural, urban; transportation modes—rail, highway, air, water, pipeline, transit; issues in finance, policy, planning, management, physical distribution, and environmental, economic, and safety regulation. Recommendations: ECON:1100 and ECON:1200. Same as ECON:3750, URP:3350.
- GEOG:3992 Undergraduate Research** arr.
Opportunity for undergraduate students to participate in faculty-led research projects.
- GEOG:4000 The United Nations Sustainable Development Goals: A Blueprint for a Sustainable Future** 3 s.h.
Establishment of baseline competencies among students from diverse backgrounds; introduction to the United Nations sustainable development goals framework; foundational concepts for sustainable development (e.g., life-cycle analysis, systems thinking, data processing, visualization). Same as SDG:4000.
- GEOG:4010 Field Methods in Physical Geography** 3 s.h.
Introduction to basic approaches to research design and of sampling environmental variables commonly used in environmental sciences; basic methods of sampling and lab analyses of vegetation, land cover, soils, and more.
- GEOG:4030 Senior Project Seminar** 3 s.h.
Development of an independent research project, preparation of a research report, and presentation of the associated outcomes. Offered spring semesters.
- GEOG:4150 Health and Environment: GIS Applications** 3 s.h.
Introduction to how geographic information systems (GIS) and spatial statistics are used in the study of patterns of health and disease in space and time. Same as GHS:4150, IGPI:4150.
- GEOG:4200 Sustainability as a System Science** 3 s.h.
Investigation of social, environmental, and economic sustainability in systems across the planet with a focus on food, energy, and water nexus; geographical and temporal trade-offs, unintended consequences, impacts quantification, role of public and private sectors, conceptual modeling of key system drivers and their interactions, nested systems, and system relations. Same as SUST:4200.
- GEOG:4310 Climate Change** 3 s.h.
Physical science of climate change; impacts on human and natural systems; mitigation of and adaptation to climate change. Prerequisites: GEOG:1020 or GEOG:2013 or EES:1080.
- GEOG:4470 Ecological Climatology** 3 s.h.
Introduction to global energy, water, and carbon cycles; biosphere-atmosphere interactions across scales ranging from leaf to globe. Prerequisites: GEOG:2310 or GEOG:2374.
- GEOG:4500 Advanced Remote Sensing** 4 s.h.
Theory and practice of remote sensing and digital image processing; practical applications to human-environment interactions. Requirements: GEOG:3500 or EES:3100 or CEE:3783. Same as IGPI:4500.
- GEOG:4520 GIS for Environmental Studies: Applications** 3 s.h.
Project-driven course to advance student knowledge of geographic information systems (GIS); application of GIS to environmental change analysis, environmental assessment, hazard/risk analysis, and environmental decision-making. Prerequisites: GEOG:3520. Same as IGPI:4520.
- GEOG:4580 Introduction to Geographic Databases** 3 s.h.
Introduction to basic building blocks of spatial database design, spatial data models, structures, relationships, queries (SQL), indexing, and geoprocessing; design and construction of various types of spatial databases, including relational and big data approaches such as ArcGIS geodatabase, PostGIS/PostgreSQL, and MongoDB. Prerequisites: GEOG:2050. Same as IGPI:4581.
- GEOG:4600 Biogeography, Ecology, and Conservation of Mammals** 4 s.h.
An overview of the class Mammalia. Topics include the evolution, diversity, functional morphology, behavior, ecology, biogeography, and conservation of mammals. Course follows a lecture/lab format and includes both field and classroom labs. Prerequisites: BIOL:1412 or GEOG:2374 or BIOL:2374.
- GEOG:4750 Environmental Impact Analysis** 3 s.h.
In-depth exposure to the history and evolution of the U.S. Environmental Impact Assessment (EIA) process; discussion of major court cases; ecological, economic, and political aspects of current environmental controversies; exposure to real-world scenarios that are crucial to understanding the EIA process in action; field trips to six or seven environmental control facilities in Iowa City and neighboring areas. Prerequisites: GEOG:1070. Same as URP:4750.
- GEOG:4770 Environmental Justice** 3 s.h.
Introduction to the field of environmental justice; understanding and addressing the processes that lead poor and marginalized communities to face a disproportionate degree of environmental risks and hazards. Same as AFAM:4770, GHS:4770.
- GEOG:4990 Senior Thesis** 3 s.h.
Original research. Requirements: senior standing.
- GEOG:4995 Honors Thesis** arr.
Original research. Requirements: honors standing.
- GEOG:5001 Readings** arr.
Supervised readings by graduate students in topics of their choice.
- GEOG:5010 Fundamentals of Geography** 3 s.h.
Geography as an academic discipline; history, advances, epistemology, common themes.
- GEOG:5050 Research and Writing in Geography** 3 s.h.
Identification of research areas; research questions and hypotheses; responsible conduct of research; methodological decisions; research proposal and paper writing.
- GEOG:5055 Geospatial Programming** 3 s.h.
Introduction to geospatial programming with Python; programming basics, data structures, and algorithms; spatial data models and structures; vector- and raster-based geoprocessing; automating GIS tasks and models; spatial libraries (e.g., ArcPy, GeoPandas, GDAL, PySAL). Same as IGPI:5055.
- GEOG:5070 Special Topics** arr.
Contemporary fields of inquiry, such as biophysical systems, GIS, locational analysis, water resources, economic geography, demographic analysis, environment, urbanization, transportation, and regional development.

GEOG:5300 Envisioning Future Worlds: Sustainable Development and Its Alternatives 3 s.h.

Sociocultural, geopolitical, and environmental implications of sustainable development and its alternatives investigated from a geographic perspective; geopolitical history of sustainable development; measures of sustainability in development; major critiques of sustainable development; alternative visions of development from different geographical contexts including ecofeminism, Buen Vivir, food sovereignty, degrowth, commoning, and the People's Health Movement. Same as GHS:5300.

GEOG:5315 Ecosystem Ecology 3 s.h.

Terrestrial ecosystems as integrators of biological, physical, and ecological processes; flows of energy, carbon, water, and nutrients within ecosystems; spatial and temporal patterns and processes of Earth's ecosystems; sustaining ecosystems in the face of global change.

GEOG:5540 Geographic Visualization 3 s.h.

Concepts and techniques that underlie cartographic representation, interaction, and geovisualization; map symbolization and visual variables; user-centered design, map use and usability engineering; web mapping, spatiotemporal visualization, multivariate mapping, interactive cartography, animation, geovisual analytics, 3D visualization, virtual and augmented reality. Same as IGPI:5540.

GEOG:5800 Environmental Policy: Theory and Practice 3 s.h.

Various types of approaches to environmental policy, with a focus on the differences between market-based (taxes and regulatory markets) and command and control (regulations and bans); assessment of approaches in terms of efficacy, efficiency, and equity; key United States and international environmental policies such as the Clean Water Act, the Endangered Species Act, and the Paris Agreement; role of technology, research, and development in addressing environmental problems. Same as PBAF:5800, URP:5800.

GEOG:6100 Seminar in Health and Environment 3 s.h.

Research on health and environment.

GEOG:6300 Seminar in Environment, Conservation, and Land Use 1-3 s.h.

Research on land use, water resources, conservation.

GEOG:6500 Seminar in Spatial Analysis and Modeling 1-3 s.h.

Research themes in spatial analysis, GIScience, simulation, remote sensing. Same as IGPI:6501.

GEOG:7000 Geography Colloquium 1 s.h.**GEOG:7150 Research in Health and Environment** 1-3 s.h.

Directed research in health and environment.

GEOG:7350 Research in Environment, Conservation, and Land Use 1-3 s.h.

Directed research in land use, water resources, conservation.

GEOG:7550 Research in Spatial Analysis and Modeling 1-3 s.h.

Directed research in spatial analysis, GIScience, simulation.

GEOG:7559 Race, Science, and Nature in Latin America arr.

Analysis of the history of United States and Latin America relations in the 20th century through the lens of scientific and agricultural change; how plant breeding, agrochemicals, heavy machinery, and irrigation systems set in motion trends that made the 20th century exceptional; possibility of feeding an unprecedented growing global population and transition of human species from being primarily rural to primarily urban in less than a hundred years; analysis of how a network of scientists, businesses, and governments made proliferation of agribusinesses possible to emphasize Indigenous and Mestizo peasants' role in that process. Same as AMST:7559, HIST:7559.

GEOG:7750 Research in Environmental Policy 1-3 s.h.

Directed research in environmental justice and policy.

GEOG:7999 Thesis arr.**Sustainability Science Courses****SUST:2013 Introduction to Sustainability** 3 s.h.

Introduction to sustainability knowledge, skills, and habits as a means to shape one's vision of a sustainable citizen; emphasis on basic skills of literacy, applied math, and finding information; traditional sustainability knowledge areas related to society, economy, and environment; intersecting themes (e.g., informed consumerism, eco-economics, and livable environments). GE: Sustainability. GE: Social Sciences. Same as BUS:2013, GEOG:2013, URP:2013.

SUST:4200 Sustainability as a System Science 3 s.h.

Investigation of social, environmental, and economic sustainability in systems across the planet with a focus on food, energy, and water nexus; geographical and temporal trade-offs, unintended consequences, impacts quantification, role of public and private sectors, conceptual modeling of key system drivers and their interactions, nested systems, and system relations. Same as GEOG:4200.