

ENVR 374 | Planetary Ecology: Climate Science, Climate Solutions

INSTRUCTOR: DR. F. BAILEY GREEN

EMAIL: BAILEYGREEN89@GMAIL.COM

Course Description

Using the framework of “planetary boundaries” and tipping points of potentially irreversible damage presented in the first documentary film entitled *Breaking Boundaries: The Science of our Planet*, this course presents climate science as well as climate solutions both from a global environmental or planetary perspective as well as from an individual and societal public and environmental health perspective. We will learn the fundamental causes and consequences of global warming that is continuing to disrupt and destabilize the Earth’s climate. We will investigate the rapid transition ending the Holocene geologic epoch that was characterized by a stable climate and the beginning of the Anthropocene marked by increasing global average temperatures and increasingly frequent and severe weather events.

We will explore climate science and climate solutions using three primary texts and many recommended texts, several documentary films, individual literature review of peer-reviewed scientific publications as well as climate journalism. In our twice weekly seminars, students will discuss the assigned readings and documentary films, lectures, and their own reviews of current and recent climate journalism on specific topics. Students will also have an opportunity to present their individual and/or small group research projects. We will take at least two field trips in or around Athens, and all of these seminar activities will contribute to our achievement of the following learning goals.

Learning Goals

The learning goals of the course will enable students to:

- Identify and distinguish the climatic differences between the Holocene and the Anthropocene epochs;
- Appreciate the interconnections between climate stability and the development of human civilizations and between climate instability and the destruction of civilizations;
- Understand the mechanisms of global warming, cooling, masking, and heat transfer by thermohaline circulation of the oceans and atmospheric circulation;
- Identify the interconnections among climate, water, energy, food, and health;
- Understand the interconnections, risks, and mutually reinforcing solutions among nine planetary boundaries conditions including climate, fresh water, oceans, biomes, biodiversity, nitrogen and phosphorus cycles, ozone layer, air pollution, and persistent human pollutants;
- Understand and appreciate the water cycle, solar desalination, freshwater stocks and flows, rainfall intensity and duration, eutrophication, sanitation, safe drinking water, human health, environmental health, and ecosystem services;
- Recognize the major physical, chemical, and biological processes for potable water treatment and for wastewater treatment, reclamation, recycle, and reuse of water energy, and nutrients;
- Analyze documentary films that address climate change, tipping points, and mutually reinforcing solutions;
- Understand and apply sustainability metrics, and techno-economic assessments, and life cycle cost analyses;
- Recognize and differentiate conventional industrial agriculture with regenerative agriculture in terms of soil health, food security, climate, environmental health, human health, and global health;
- Compare and contrast linear and circular economies, as well as hard and soft energy paths;

- Investigate and consider embracing climate solutions that reduce, eliminate, and draw down atmospheric concentrations of greenhouse gas (GhG) emissions, decarbonize, and transform our economies and lifestyles by an increased use of renewable energy, nature-based solutions for water, and healthier diets;
- Distinguish between conventional pollution prevention/waste disposal technologies and the emerging Nature-based Solutions for waste reclamation, resource recovery, and reuse;
- Understand and appreciate the work of climate scientists including their materials & methods, observations, measurements, data, findings, and advocacy;
- Evaluate climate science, skepticism, journalism, advocacy, and activism; and,
- Envision a career in environmental science, engineering, infrastructure management, education, policy, regulation, justice, diplomacy, journalism, and activism.

Course Requirements and Assessment

CYA Attendance Policy

CYA regards attendance in class and on-site (in Athens or during field trips) as essential, so attendance at all scheduled meetings is required. All absences will be recorded, and they may affect one's grade.

Students will be required to read, or listen, carefully and critically to three required books. Students will also be required to watch and study three required documentary films. If we can find some extra time, we may try to add one or two additional documentary films between our three books. Students may be asked to present short synopses of key concepts presented in the required books and documentary films. Finally, students will be required to select and prepare an independent research project on a climate-related topic about which they are interested, intrigued, or passionately committed and with the professor approval write a double spaced, eight-to-ten pages, 2,000-to-2,500 word paper including references.

• **Class Contributions 25%** – Education is both an individual and a social enterprise. Your class contributions will account for 25% of your final grade. Your class contributions grades will reflect your being on time, prepared, attentive, and fully engaged in our class discussions and your individual presentations. You may also post on the Moodle forum; but these postings are not a substitute for class participation. Assignments of book chapters and documentary films are to be completed before the class session during which they are discussed. Short quizzes on key concepts, terminology, and interactions may be given periodically to evaluate your preparation for class participation. Suffice it to say that your class contributions grade will be one of the most important factors for determining your final course grade. I expect you to come prepared to engage and contribute during class discussions. Class discussions will provide students opportunities to raise questions, to clarify complex mechanisms, and to comment on the required readings and documentary films. I expect everyone to thrive and feel comfortable in a collegial and collaborative atmosphere of mutual respect. We will learn together and from each other, and our smaller class size will be ideal for a seminar as opposed to a larger class size, lecture-only course. You will find that you learn more when you are well prepared and actively engaged in class discussions. You will also learn as you select, prepare, and present your independent research project on a climate-related topic of your choice and through tracking your chosen topic through climate literature and journalism. Please feel free to speak with me during office hours or by email if any difficulties arise for you in the category of class contributions.

• **Midterm Exam 20%** – key climate science concepts, terminology, boundary conditions, tipping points, feedback loops, methods, mechanisms, interconnected systems, rates of change, impacts, and solutions.

• **An individual research Report (8-10 pages) and a class Presentation (10-15 minutes) 25%** – Topics and instructions regarding your report and presentation will be discussed during the first week and you will have an opportunity to select your topic over the first two to three weeks. Your written reports will be due and your presentations will be made during the final two classes before the Final Exam week.

- **Final Exam 30%** – key climate science concepts, terminology, boundaries conditions, tipping points, feedback loops, methods, mechanisms, interconnected systems, rates of change, impacts, sustainability metrics, and solutions.

Policy on Assignments and Make-up Work

Details about assignments and exams will be given in advance. I will accept no late assignments, nor will I offer a make-up exam unless you have requested and discussed your reasons with me in advance. If you are unable to come to class for any reason, please let me know beforehand.

CsYA Policies and Regulations

Academic Accommodations

Students are required to submit an official letter from the office at their school that handles academic accommodations (generally the Office of Disability Services), or to have that office send a letter. Students who have submitted such a letter to CYA should also talk to their professors individually to discuss how these accommodations will work in each specific course.

Site Visits and Accessibility

The class meetings for this course will be held on the CYA campus.

This course requires students to give a verbal individual presentation in front of the class as part of their course assessment. However, I would accommodate a student who wishes to do an alternative delivery of their verbal presentation.

ePolicy on Original Work

Plagiarism is literary theft. As such, it is a serious offense which will not be tolerated either at your home institution or at CYA. Plagiarism on an examination or in a paper will result in an F for the course. You must cite the author of any and all ideas that you use that are neither common knowledge nor your own idea. If you are in doubt, it is safest to cite the source. Your work should be original and reflect your own ideas and thoughts. If you are unsure about what counts as original work, please check the Student Handbook; and, if you are still uncertain, please consult with your professor.

Use of Laptops

In-class use of laptops or tablets will be permitted for the express purposes of note-taking. Cell phones may not be used in class.

Upgrade to 400-level course

Courses can be upgraded to a 400-level. Doing so typically adds approximately 25% additional work on the part of the student. The option to upgrade opens the second week of classes. If you are interested in this option, please talk to your professor.

Required Readings

Gleick, Peter. (2023). The Three Ages of Water: Prehistoric Past, Imperiled Present, and a Hope for the Future, NY: PublicAffairs, Hachette Book Group, pp. 356.

Linden, Eugene. (2006). The Winds of Change: Climate Weather, and the Destruction of Civilizations, New York, NY: Simon & Schuster Paperbacks, pp. 319.

Montgomery, David R. (2012). Dirt: The Erosion of Civilizations, Berkeley, CA: UC Berkeley Press, 10 chapters, approximately pp. 250.

Fall 2024 Tentative Schedule

Day #	Date/Day	Topic / Readings / Assignments Due / Place (if applicable)
	Sep 5-7	Field Study Delphi and Ancient Olympia
1	Sep 10	Course and Class Introductions, Overview, Learning Objectives, Opportunities, Expectations, Assignments, Requirements/Readings, Documentary Films, climate topics to track in news and journalism / watch "Breaking Boundaries: The Science of Our Planet" available online on Netflix
2	Sep 12	"Breaking Boundaries" class discussion #F1 / rewatch and outline the major concepts, examples, and the nine interconnected systems whose boundaries and risk factors are presented in "Breaking Boundaries" and read the first half of Part One (pp. 1-40) in The Winds of Change: Climate, Weather, and the Destruction of Civilizations.
3	Sep 17	Part One Preface and "Opening Arguments" in <u>The Winds of Change</u> class discussion B1-#1 / select a climate topic and news outlet to follow throughout the course; read the second half of Part One (pp. 41-85) in <u>The Winds of Change</u> , and review your reading notes and your questions
	Sep 18-21	Field Study Crete
4	Sep 24	Part Two "Evidence" in <u>Winds of Change</u> class discussion B1-#2 plus announcements of your selected climate topic and news outlet / read Part Two (pp. 89-146) in <u>The Winds of Change</u> and review your reading notes and your questions
5	Sep 26	Part Three "Cross Examination & Redirect" in <u>Winds of Change</u> class discussion B1-#3 / read Part Three (pp. 149-178) in <u>The Winds of Change</u> and review your reading notes and your questions
6	Oct 1	Part Four "El Nino: The Killer Next Door" in <u>The Winds of Change</u> class discussion B1-#4 / read Part Four (pp. 181-216) and review your reading notes and your questions
7	Oct 3	Part Five "The Elephant in the Room" in <u>Winds of Change</u> B1-#5 / read Part Five (pp. 219-243) in <u>Winds of Change</u> and review your reading notes and questions
8	Oct 8	Part Six "Closing Arguments: Are we Next?" Afterword and Chronology in <u>Winds of Change</u> class discussion B1-#6 / read Part Six and the following Afterword and Chronology (pp. 247-304) and review your reading notes and questions
9	Oct 10	"Blue Gold: World Water Wars" class discussion #F2 / view "Blue Gold: World Water Wars" and read the Preface, Introduction, and first half of Part One "Prehistoric Past" (pp. 1-40) in <u>The Three Ages of Water: Prehistoric Past, Imperiled Present, and a Hope for the Future</u>
10	Oct 15	Part One "Prehistoric Past" in <u>The Three Ages of Water</u> class discussion B2-#1 / read the second half of Part One (pp. 41-89) and review your Part One reading notes and questions
11	Oct 17	Part Two "Imperiled Present" in <u>The Three Ages of Water</u> class discussion B2-#2 / read the first third of Part Two (pp.93-130), review your reading notes and questions
12	Oct 22	Midterm Week Review Session for the Midterm Exam
13	Oct 24	Midterm Week Midterm Exam
	Oct 25-Nov 3	Fall Break
14	Nov 5	Part Two "Imperiled Present" in <u>The Three Ages of Water</u> class discussion B2-#3 / read the second third of Part Two (pp.131-177), review your reading notes and questions
15	Nov 7	Part Two "Imperiled Present" in <u>The Three Ages of Water</u> class discussion B2-#4/ read the third section of Part Two (pp. 178-220), review your reading notes and questions
	Nov 12-15	Field Study Peloponnese
16	Nov 19	Part Three "A Hope for the Future" in <u>The Three Ages of Water</u> class discussion B2-#5 / read the first half of Part Three (pp. 223-257), review your reading notes and questions

Day #	Date/Day	Topic / Readings / Assignments Due / Place (if applicable)
17	Nov 21	Part Three "A Hope for the Future" in <u>The Three Ages of Water</u> class discussion B2-#6 / read the second half of Part Three (pp. 258-300), review your reading notes and questions
18	Nov 22	"Kiss the Ground," a regenerative agriculture documentary film class discussion #F3 / watch "Kiss the Ground" documentary film, outline the differences between conventional agriculture and regenerative agriculture and your questions
19	Nov 26	Preface and Chapter 1, 2, & 3 of <u>Dirt: Erosion of Civilizations</u> class discussion B3-#1 / read the Preface and chapters 1, 2, & 3 of <u>Dirt</u> , review your reading notes and questions
	Nov 28-Dec 1	Thanksgiving Break
20	Dec 3	Chapters 4, 5, & 6 of <u>Dirt: Erosion of Civilizations</u> class discussion B3-#2 / read Chapters 4, 5, & 6 of <u>Dirt</u> , review your reading notes and questions
21	Dec 5	Chapters 7 & 8 of <u>Dirt: Erosion of Civilizations</u> class discussion B3-#3 / read Chapters 7 & 8 of <u>Dirt</u> , review your reading notes and questions
22	Dec 6	Chapters 9 & 10 of <u>Dirt: Erosion of Civilizations</u> class discussion B3-#4 / read Chapters 7 & 8 of <u>Dirt</u> , review your reading notes and questions
23	Dec 10	Student Presentations
24	Dec 12	Student Presentations
	Dec 17	Final Exam Week Final Exam Review
	Dec 19	Final Exam Week Final Exam

Schedule at a glance

Day #	Date	Session	Venue
	Sep 5-7	Field Study	Delphi and Ancient Olympia
1	Sep 10	Course Introduction	CYA
2	Sep 12	Breaking Boundaries: The Science of Our Planet	CYA
3	Sep 17	<u>The Winds of Change</u> 1	CYA
	Sep 18-21	Field Study	Crete
4	Sep 24	<u>The Winds of Change</u> 2	
5	Sep 26	<u>The Winds of Change</u> 3	CYA
6	Oct 1	<u>The Winds of Change</u> 4	CYA
7	Oct 3	<u>The Winds of Change</u> 5	CYA
8	Oct 8	<u>The Winds of Change</u> 6	CYA
9	Oct 10	"Blue Gold: World Water Wars"	CYA
10	Oct 15	<u>The Three Ages of Water</u> 1	CYA
11	Oct 17	<u>The Three Ages of Water</u> 2	CYA
12	Oct 22	Midterm Review	CYA
13	Oct 24	Midterm Exam	CYA
	Oct 25-Nov 3	Fall Break	
14	Nov 5	<u>The Three Ages of Water</u> 3	CYA

Day #	Date	Session	Venue
15	Nov 7	<u>The Three Ages of Water 4</u>	CYA
	Nov 12-15	Field Study	Peloponnese
16	Nov 19	<u>The Three Ages of Water 5</u>	CYA
17	Nov 21	<u>The Three Ages of Water 6</u>	CYA
18	Nov 22	Make-up T TH class) "Kiss the Ground," "Common Ground," or "Look & See"	CYA
19	Nov 26	<u>Dirt: Erosion of Civilizations 1</u>	CYA
	Nov 28-Dec1	Thanksgiving Break	
20	Dec 3	<u>Dirt: Erosion of Civilizations 2</u>	CYA
21	Dec 5	<u>Dirt: Erosion of Civilizations 3</u>	CYA
22	Dec 6	Make-up T TH class) <u>Dirt: Erosion of Civilizations 4</u>	CYA
23	Dec 10	Student Presentations	CYA
24	Dec 12	Student Presentations	CYA
	Dec 17	Final Exam Review	CYA
	Dec 19	Final Exam	CYA

Course Bibliography (Required and Supplementary Readings)

Gleick, Peter. (2023). The Three Ages of Water: Prehistoric Past, Imperiled Present, and a Hope for the Future, NY: PublicAffairs, Hachette Book Group, pp. 356.

Linden, Eugene. (2006). The Winds of Change: Climate Weather, and the Destruction of Civilizations, New York, NY: Simon & Schuster Paperbacks, pp. 319.

Montgomery, David R. (2012). Dirt: The Erosion of Civilizations, Berkeley, CA: UC Berkeley Press, 10 chapters., approximately pp. 250.

Recommended Reading:

Berry, Wendell. (2017). The World-Ending Fire: The Essential Wendell Berry, Berkeley, CA: Counterpoint Press, pp. 351.

Berry, Wendell. (1977). The Unsettling of America: Culture and Agriculture, Berkeley, CA: Counterpoint Press, pp. 240.

Gates, Bill. (2021). How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need, New York, NY: Alfred A. Knopf, pp. 257.

Gleick, Peter, and co-authors at The Pacific Institute for Studies in Development, Environment, and Security. (1998-2018). The World's Water Volumes 1-9, Washington, DC: Island Press, approximate 400 to 500 pages each volume.

Johnson, Steven. (2006). The Ghost Map: The Story of London's Most Terrifying Epidemic—and How It Changed Science, Cities, and the Modern World, New York, NY: Riverhead Hardcover, pp. 320.

Koonin, Steven E. (2021). Unsettled: What Climate Science Tells Us, What It Doesn't, and Why it Matters, Dallas, TX: BenBella Books, Inc., pp. 306.

Mann, Michael E. (2023). Our Fragile Moment: How Lessons from Earth's Past Can Help Us Survive the Climate Crisis, New York, NY: PublicAffairs, The Hachette Book Group, pp. 306.

McKibben, Bill. (2010). Eaarth: Making a Life on a Tough New Planet, New York, NY: Times Books, Henry Holt and Company, pp. 253.

Nordhaus, William. (2013). The Climate Casino: Risk, Uncertainty, and Economics for a Warming World, New Haven, CT: Yale University Press, pp. 378.

Schell, Jonathan. (1982). The Fate of the Earth, New York, NY: Alfred A. Knopf, pp. 244.

Tickell, Josh. (2018). Kiss the Ground: How the Food You Eat Can Reverse Climate Change, Heal Your Body & Ultimately Save Our World, New York, NY, Simon and Shuster, Atria/Enliven Books, pp. 352.