

Science and Policy of Climate Change ENVI - 3010 (4 credits)

International Honors Program (IHP) **IHP Climate Change: The Politics of Land, Water, and Energy Justice**

This syllabus is representative of a typical semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Course Description

Climate change is both a natural and human-induced phenomenon, which affects the sustainable development of societies in different ways. This course is intended to provide the foundational scientific concepts for students to understand the drivers and impacts of anthropogenic climate change. However, anthropogenic climate change needs to be understood as a multi-faceted environmental *and* political crisis. To the extent that science can help us deal with climate change as a matter of natural resource management, it also has a profoundly political dimension. Despite the consolidation of scientific consensus around climate change, an underlying assumption we take in this course is that the most crucial yet vexing solutions are political. This course therefore also aims to critically engage with the science/policy interface. We examine local, regional, and national mitigation and adaptation strategies as a matter of natural resource management and social policy. We learn about environmental governance mechanisms at local and regional levels, national climate policy frameworks, and global climate change negotiations.

Foundational concepts of climate change science that will be covered include: Earth's climate system and its major components, systems theory, climate system dynamics and spatial patterns, feedback loops, matter/energy flows, and energy/heat transfer processes, climate change history, and climate modelling. Some of the policy topics that may be addressed include: The institutional architecture of climate change policy-making mechanisms at global and national levels, the history and current status of

global climate change negotiations, the role of science and technology in mitigation and adaptation strategies, the cost-effectiveness of different climate change mitigation and adaptation strategies in regard to local and national realities, and the role of risk assessments in risk-reduction strategies.

Methodology

This course follows an interdisciplinary perspective that combines different knowledge and fields of expertise from both social and physical sciences. Class discussions will rely on peer-reviewed articles across a wide range of disciplines, as well as on policy documents and NGO reports. The course will closely complement the Comparative Issues in Food, Water, and Energy and the Political Economy and Environmental Change courses, as well as site visits and guest lectures in each country, in order to address the global issue of climate change science and policy from different angles and in different national and local contexts.

Learning Outcomes

Upon completion of the course, students will be able to:

- Explain the basic science of climate change and its impacts on ecosystems and human societies in relation to other drivers of environmental change
- Evaluate potential strategies and response mechanisms aimed at climate change mitigation and adaptation
- Explain the notion of vulnerability and the differentiated capacity of individuals and communities to cope with and adapt to climate change and disaster risks
- Critically assess the role of science and technology in mitigation and adaptation efforts, their potential as well as limitations
- Understand the role of policy in climate change mitigation and adaptation efforts at the national level, and the contentious geopolitics of climate change negotiations at the global level
- Describe the actors and institutions engaged in national and global climate change policy efforts
- Show familiarity with the legal frameworks involved relevant to national climate change policies

Evaluation and Grading Criteria

Assessments:

Country Assignment (Morocco) Climate Change Science Problem Set/Quiz	(2x15%)
	30%
Country Assignment (Nepal)	30%
Country Assignment (Ecuador)	30%
Participation	10%

Nepal Individual Presentation and Essay (30%)

All students are invited to give a presentation no longer than 4 minutes (either oral, PowerPoint or video) and to write an accompanying 1200-word essay about an environment/livelihood/development theme observed during the field trips that indicates resilience, adaptation, or climate impact on local communities in Nepal. Try to zoom out to link it to larger nation/global issues.

In-Country Assignments in Morocco and Ecuador, Including Quiz and Problem Sets (30% x 2)

These lectures on climate change science and policy from in-country scientists and climate policy experts have been curated to provide you with a solid grasp of the science of global warming and climate change, and of policy responses at the regional, national, and international scale. Those with a science background may consider some of this a refresher, while to others this material may be new. You will have one problem set (all work must be shown) and one quiz (multiple re-takes are permitted) on this material in Morocco and one problem set in Ecuador, as well as a group presentation in Ecuador.

**Grading
Scale**

94-100%	A	Excellent
90-93%	A-	
87-89%	B+	
84-86%	B	Above Average
80-83%	B-	
77-79%	C+	
74-76%	C	Average
70-73%	C-	
67-69%	D+	
64-66%	D	Below Average
Below 64	F	Fail

Expectations and Policies

- Show up prepared. Be on time, have your readings completed and questions in mind for discussion or clarification. Being prepared raises the level of class discussion for everyone. This includes being punctual and prepared for guest lectures and site visits. All students are expected to be present at every program session, with the only exceptions being illness (written note required from a non-IHP adult, e.g. homestay parent, or preferably, health care professional). Unexcused absences and habitual lateness will result in penalties reflected in your participation grade. Please inform the traveling faculty or fellow if tardiness is anticipated.
- Have assignments completed on schedule and done in accordance with the specified requirements. This will help ensure that your assignments are returned in a timely manner. Points will be deducted for assignments turned in late.
- Ask questions in class. Be attentive, respectful and engaged with the guest lecturers and site visit hosts. These are often very busy professionals and community leaders who are doing us an honor by meeting with us and deserve your full attention and respect.
- Comply with academic integrity policies (no plagiarism or cheating, nothing unethical). Any plagiarism or cheating will result in a score of zero for that assignment and could result in additional disciplinary measures as outlined in the Academics section of the IHP Student Handbook.
- Respect differences of opinion (classmates, lecturers, site visit hosts, homestay families). You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.
- Be pro-active and flexible and take ownership of your learning experience as individuals and as a group. The experiential model of learning requires that you look forward and back across the semester. The logistics of our time in each country means that coursework will not always develop in a strictly linear fashion.
- Electronic devices: The use of phones, tablets and laptops are not permitted during site visits and guest lectures. We will discuss the need for the use of technology during this course.

Please refer to the SIT Student Handbook for policies on academic integrity, ethics, warning and probation, diversity and disability, sexual harassment, and the academic appeals process.

Recommended Textbooks

- Dessler, A. E. (2022). Introduction to Modern Climate Change (3rd edition). Cambridge University Press.
- Archer D. (2012). Global Warming: Understanding the Forecast (2nd edition). Wiley. Online resources: <http://forecast.uchicago.edu/lectures.html>

Course Schedule

LAUNCH, SAN FRANCISCO

Session 1, Dr. Sonya Ahamed: Course

Introduction Launch, Required Materials:

Global: Podcast: [The Climate Pod: COP28: What's Behind the Headlines?](https://www.theclimatepod.com/episodes/episode/2e0ed25b/cop28-whats-behind-the-headlines-with-nina-lakhani-aderonke-ige-and-rachel-rose-jackson) Dec 16, 2023 (1hr 9 min) <https://www.theclimatepod.com/episodes/episode/2e0ed25b/cop28-whats-behind-the-headlines-with-nina-lakhani-aderonke-ige-and-rachel-rose-jackson>

National: Podcast: [A Matter of Degrees: The Journey of Justice](https://www.degreespod.com/episodes/season-3-episode-9)40. Feb 15, 2023. (46 min) <https://www.degreespod.com/episodes/season-3-episode-9>

Recommended:

Listen: [A Matter of Degrees: This Is a Big \(Climate\) Deal: What's In the Inflation Reduction Act?](https://www.degreespod.com/episodes/bonus-episode-3)
Aug 3, 2022. (63 min) <https://www.degreespod.com/episodes/bonus-episode-3>

Local: San Francisco Climate Action Plan, 2021. <https://sfenvironment.org/climateplan>
Read the Plan: https://sfenvironment.org/sites/default/files/events/cap_fulldocument_wappendix_web_220124.pdf

IPCC Sixth Assessment Report AR6 – WG II 2022 – Cross Chapter Paper 2: Cities and Settlements by the Sea. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 2163–2194, <https://www.ipcc.ch/report/ar6/wg2/>

Featured Site Visits:

Angel Island, Talk: Climate change impacts on Bay Area ecosystems and guided hike led Angel State Park Interpretive Specialist Evan Weissman

Eco-Center at Heron's Head Park, Talk: Social and Environmental Justice in San Francisco's District 10, Bay View/Hunter's Point by Arieann Harrison

Additional Recommended Sources:

Just Transitions

Movement Generation. (2016). From banks and tanks to cooperation and caring: A strategic framework for a just transition. https://movementgeneration.org/wp-content/uploads/2016/11/JT_booklet_Eng_printspreads.pdf

Kashwan, 2021. Climate Justice in the Global North: An Introduction. *Case Studies in the Environment*, 2021, pps. 1–13.

IPCC Sixth Assessment Report AR6 – WG II 2022 – Ch 14: **North America**. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 1922–2042, <https://www.ipcc.ch/report/ar6/wg2/>

MOROCCO

Session 2, Dr. Kenza Khomsi: *Climate Change, Consequences and Actions (Morocco and MENA Region)* This class will provide an overview of climate change impacts for the countries of the Mediterranean and North Africa (MENA) region, with an emphasis on Morocco. The class will then focus on the key challenges and the potential pathways the country has chosen in order to adapt to climate change and build a sustainable economic development that is also socially inclusive and environmentally sustainable.

Required Materials:

MOROCCO NATIONALLY DETERMINED CONTRIBUTION UNDER THE UNFCCC, 2016 (<http://www4.unfccc.int/ndcregistry/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf>)

Donat, M. G., et al. (2014) *Changes in Extreme Temperature and Precipitation in the Arab Region: Long-Term Trends and Variability Related to ENSO and NAO*. *International Journal of Climatology* 34: 581-592. doi: 10.1002/joc.3707.

Recommended Readings:

Khomsi K., Mahe G., Trambly Y., Sinan M., and Snoussi M.: Regional impacts of global change: seasonal trends in extreme rainfall, run-off and temperature in two contrasting regions of Morocco, *Nat. Hazards Earth Syst. Sci.*, 16, 1079-1090, <https://doi.org/10.5194/nhess-16-1079-2016>, 2016.

IPCC Sixth Assessment Report AR6 – WG II 2022 – Cross Chapter Paper 3: **Deserts, Semi-Arid Areas, and Desertification**. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 2195–2232, <https://www.ipcc.ch/report/ar6/wg2/>

IPCC Sixth Assessment Report AR6 – WG II 2022 – Cross Chapter Paper 4: **Mediterranean Region**.

In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 2233–2272, <https://www.ipcc.ch/report/ar6/wg2/>

Session 3: Dr. Kenza Khomsi, Radiation and Energy Balance

In this session, students will be introduced to basic concepts in physics needed to understand climate change science.

Climate Change Science Introductory Videos:

Archer, D. Videos: [Intro to Global Warming](#) (6:01); [Using Units](#) (3:44); [Units of Energy](#) (5:12); [Units of Light](#) (3:16); [Heat](#) (4:15); [Light](#) (5:48); [Blackbody Radiation](#) (6:07); University of Chicago MOOC. [This should be mostly review for science majors in the group and helpful for those majoring in other subjects.] *The selected videos above can also be accessed from the full set of videos here:*
<http://forecast.uchicago.edu/lectures.html>

Dessler, AE. (2022). Chapter 3 “Radiation and Energy Balance,” *Introduction to Modern Climate Change*, (pp. 39-50) **OR/AND**

Archer, D. (2011). *Global Warming: Understanding the Forecast*. Chapter 2. “Blackbody Radiation” pp. 9-17.

Recommended Readings:

Dessler, AE. (2022). Chapter 1 “An Introduction to the Climate Problem” (pp. 1-15) and Chapter 2 “Is the Climate Changing?” (pp. 16-38).

Archer, D. (2012). *Global Warming: Understanding the Forecast*. Chapter 1. “Humankind and Climate” pp. 1-5.

Intergovernmental Panel on Climate Change (IPCC): “Climate Change 2021: The Physical Science Basis,” Summary for Policymakers, pp. 4-31 (2021).
<https://www.ipcc.ch/report/ar6/wg1/>

Related Morocco Site Visits:

AMEE (Energy Efficiency) and Technopolice Basin Water Transfers

NEPAL

This lecture series, featuring well-known journalist **Kunda Dixit** as our local faculty, will analyze the impact of climate breakdown on the Himalayan mountains, its people and countries downstream. This lecture series will also look into how the mass media and the social web cover disasters: both sudden catastrophes like earthquakes, and slow-moving crises like climate. Students will attend four lectures, two guest lectures, and participate in field trips with climate change experts.

Session 4: The Layer Model and Greenhouse Gases

In session we will work with a simple climate model and consider the impact of greenhouse gases.

VIDEOS:

Archer, D. Climate model and GHG Videos: [No Atmosphere Climate Model](#) (8:13); [The Greenhouse Effect](#) (9:41); [Greenhouse Gas Physics](#) (7:43); [The Band Saturation Effect](#) (12:41) University of Chicago MOOC. [Total ~37 minutes]
The selected videos above can also be accessed from the full set of videos here:
<http://forecast.uchicago.edu/lectures.html>

Textbook Chapters:

Dessler, AE. (2022). *Introduction to Modern Climate Change*. Chapter 4: "A Simple Climate Model" (pp. 53-68) **AND/OR**

Archer, D. (2011). *Global Warming: Understanding the Forecast*. Chapter 3 "The Layer Model" (pp 19-28), Chapter 4 "Greenhouse Gases" (pp 29-41)

Optional Materials:

Video: How Do Greenhouse Gases Actually Work? (3:08)

<https://www.youtube.com/watch?v=sTvqliqvTg>

Session 5, Kunda Dixit: *Climate impacts on the Hindu Kush-Himalaya and Tibetan Plateau*

Students will get an overview of how increasingly extreme weather events, shrinking glaciers, receding water tables and unsurvivable 'wet-bulb' heat waves threaten the inhabitants of the 'roof of the world'. We will discuss *The Nutmeg's Curse* and *The Ministry for the Future*, considering the ways in which colonialism and its suppression of indigenous peoples and nature was an antecedent to the present planetary emergency. An extreme global crisis could galvanize governments, if the media can create a suitable 'climate' for action.

Reading:

All We Can Save: Truth, Courage and Solutions for the Climate Crisis Edited by Ayana Elizabeth Johnson and Katharine K Wilkinson Penguin Random House, 2021 ISBN 9780593237083

The Ministry for the Future: A Novel by Kim Stanley Robinson Orbit Books, 2020 ISBN 13: 9780316300148

The Nutmeg's Curse: Parables for a Planet in Crisis by Amitav Ghosh, 2021, ISBN 13 978- 1529369434

Dateline Earth: Journalism as If the Planet Mattered by Kunda Dixit Inter Press Service 1997, 2012 ISBN 9786169022725

Session 6, Guest Lecture, Tasha Ghale

Climate change impacts on snow leopards in the High Himalayas

Session 7, Peer to Peer Interaction Program: Harin Nepal Climate Activists

Session 8, Guest Lecture, Tunga Rai: "Building a Just, Sustainable and Equitable Future"

Session 9, Guest Lectures: Climate change and its impacts in village communities

During our extended excursions in the Terai, Pokhara, and Sikkim, we will hear from local experts on the impacts of climate change in village communities.

Session 10, Kunda Dixit: Climate Change Adaptation in Nepal

How communities across Nepal are adapting to the impact of the climate crisis, even without knowing what is causing erratic monsoons, prolonged droughts, intense storms, wildfires, springs going dry. We will probe the interlinkages between climate refugees,

migration, falling agriculture production, government apathy and political failure. Students will also learn about how Nepalis have always coped with government neglect, and the climate crisis is just the latest adversity they are facing.

Required Viewing

Sustainable Summits: Climate Solutions from the Top of the World
<https://www.youtube.com/watch?v=2yOcrOvcBSs>

Session 11, Kunda Dixit: **Political implications of climate denial / Student Presentations**

Political implications of climate denial, social-economic impact on developing countries, a post-Glasgow perspective on who pays for adaptation and mitigation. Critique of movie *Don't Look Up* as an allegory to climate breakdown and the response of mass media and politicians. The media's handling of scientific uncertainty, false equivalence, media as interface between scientists and the public.

Students will give individual oral presentations on one aspect of what they have learnt at the end of the lecture series.

Required readings:

Climate Coverage Feels the Heat Again by Jon Allsop *Columbia Journalism Review*
https://www.cjr.org/the_media_today/heat_pacific_northwest_media_climate.php

Dixit, K. Nepal Earthquake: Why the Truth Was a Casualty in Rush to Formulaic Coverage *BBC Academy Blogs*

Conlin, T. The 'Green Influencers' targeting the TikTok Generation. *The Guardian*
<https://www.theguardian.com/environment/2021/jun/15/the-green-influencers-targeting-the-tiktok-generation>

ICIMOD Site Visit:

Recommended Readings

IPCC Sixth Assessment Report AR6 – WG II 2022 – Cross Chapter Paper 5: **Mountains**. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 2273- 2318, <https://www.ipcc.ch/report/ar6/wg2/>

IPCC Sixth Assessment Report AR6 – WG II 2022 – Ch 10: **Asia**. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change pp. 1457–1580, <https://www.ipcc.ch/report/ar6/wg2/>

ECUADOR

COURSE OBJECTIVE

The objective of this course is to provide students with an understanding of climate change and energy transition as a highly complex global problem from an interdisciplinary perspective that involves basic earth sciences as well as a political economy and political ecology perspectives, with an emphasis on large-scale mining in the Andean region and Ecuador.

LEARNING OUTCOMES

- Show mastery of key concepts and debates around modeling the future of anthropogenic climate change
- Understand the political economy and political ecology of climate change and the energy transition from an Andean and Ecuadorian perspective
- Identify and articulate key issues related to global policies of mitigation and adaptation to climate change based on class activities including participation in the World Climate Simulation

BRIEF DESCRIPTION OF THE CLASSES AND SITE VISITS

APRIL 17th: SESSION 1: Climate change policies from local to global: challenges in design and implementation w/Analiz

This class will explore the variety of policies, laws and regulations that aim to tackle climate change and the relationship between domestic climate policy and international climate change agreements. We will survey the extent and sectoral coverage of policies around the world and most common instruments as well as their challenges in application. The lesson will introduce Ecuador's climate policies and the recent Yasuni ITT Referendum linked to the importance of collective action as a response to the climate crisis.

Required reading(s):

Reality Check: Lessons from 25 Policies Advancing a Low-Carbon Future. Climate Change and Development Series. Chapter 1.

<https://openknowledge.worldbank.org/handle/10986/40262>

Recommended reading(s):

- World Bank Reference Guide to Climate Change Framework Legislation <https://documents1.worldbank.org/curated/en/267111608646003221/pdf/World-Bank-Reference-Guide-to-Climate-Change-Framework-Legislation.pdf>
- Database of climate laws of the world: <https://climate-laws.org/>
- Governmentalities, hydrosocial territories & recognition politics: The making of objects and subjects for climate change adaptation in Ecuador <https://www.sciencedirect.com/science/article/pii/S0016718520301822>
- Agroecological Practices as a Climate Change Adaptation Mechanism in Four Highland Communities in Ecuador <https://muse.jhu.edu/pub/15/article/760931/summary>
- Climate change anxiety and mental health: Environmental activism as buffer <https://link.springer.com/article/10.1007/s12144-022-02735-6>

APRIL 19th: SESSION 2 Geopolitics, equity and justice in climate policy w/Analiz

This class will implement the World Climate Simulation game of global climate negotiations as a way to explore the political challenges behind the implementation of the Paris Agreement and the relevance of power and equity at the United Nations Framework Convention on Climate Change Conferences of the Parties (COP). See

<https://www.climateinteractive.org/world-climate-simulation/>

Required reading(s):

Beyond good intentions, to urgent action: Former UNFCCC leaders take stock of thirty years of international climate change negotiations

<https://www.tandfonline.com/doi/abs/10.1080/14693062.2020.1860567>

Briefing of your assigned negotiation group, to be distributed in the previous class.

Recommended Readings:

- “Youth is not a political position”: Exploring justice claims-making in the UN Climate Change Negotiations
<https://www.sciencedirect.com/science/article/abs/pii/S0959378019309045>
- Unpacking the unequal representation of Northern and Southern NGOs in international climate change politics
<https://www.tandfonline.com/doi/abs/10.1080/01436597.2019.1596023>
- Normative Shifts in the Global Conception of Climate Change: The Growth of Climate Justice <https://www.mdpi.com/2076-0760/8/1/24>

FROM APRIL 21ST TO APRIL 27th: AMAZON EXCURSION

- Learn about the Chevron Texaco trial from the perspective of the Kichwa people.
- Learn from different perspectives (actors) about Ecuador’s development project and analyze the tensions that arise in practice in relation to extraction and large monocrops in the Amazon territory.
- Visit local communities to hear their stories, learn about their livelihoods and community tourism initiatives. Immerse yourself in the biodiversity of Yasuní.

OPTIONAL SESSION 3: The Layer Model and Greenhouse Gases

In this session we will examine a simple climate model and consider the impact of greenhouse gases on Earth’s climate.

Materials:

Dessler, AE. (2022). Introduction to Modern Climate Change. Chapter 4: “A Simple Climate Model” (pp. 53-68) AND/OR

Archer, D. (2011). Global Warming: Understanding the Forecast. Chapter 3 “The Layer Model” (pp 19-28), Chapter 4 “Greenhouse Gases” (pp 29-41)

ECUADOR EVALUATION (Assessment for the course includes the following components):

1. Participation at World Climate Simulation game of global climate negotiations and Class Participation w/Analiz (60%)
2. Reflection paper (40%) doubled-spaced, 12pt. Times New Roman, 1-in. margins.

Reflect on your participation during the World Climate Simulation by writing an essay of 500 rds answering the following questions:

- a) Formulate three questions you have about global climate policies and action after participating in the WCS exercise;
- b) What would you do differently if you had to participate in the simulation again?
- c) How would you connect this to your experiences with climate change and just transitions at home?