HONR 229L: Climate Change: Science, Economics, and Governance

Meeting #1: Class Overview

Ross Salawitch & Laura McBride

rjs@atmos.umd.edu    mcbridel@terpmail.umd.edu

Class Web Site: http://www.atmos.umd.edu/~rjs/class/honr229L

ELMS Page: https://myelms.umd.edu/courses/1249026

A child surrounded by flood water in Bangladesh. Credit: DFID-Rafiqur Rahman Raqu

28 August 2018
Climate Change: Science, Economics, and Governance

Course theme: how should society address global warming?
- history
- science
- economics

Today’s goals:
1) Introductions
2) Description of how course will be run
3) Brief discussion about climate change, focus on recent news
Climate Change: Science, Economics, and Governance

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- Progress, far from consisting in change, depends on retentiveness. When change is absolute there remains no being to improve and no direction is set for possible improvement: and when experience is not retained, as among savages, infancy is perpetual. Those who cannot remember the past are condemned to repeat it.
  - This famous statement has produced many paraphrases and variants:
    - Those who cannot learn from history are doomed to repeat it.
    - Those who do not remember their past are condemned to repeat their mistakes.
    - Those who do not read history are doomed to repeat it.
    - Those who fail to learn from the mistakes of their predecessors are destined to repeat them.
    - Those who do not know history's mistakes are doomed to repeat them.
  - There is a similar quote by Edmund Burke that often leads to misattribution, "People will not look forward to posterity, who never look backward to their ancestors."
Climate Change: Science, Economics, and Governance

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https://en.wikiquote.org/wiki/George_Santayana
Climate Change: Science, Economics, and Governance

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George Santayana: Philosopher, essayist, poet and novelist.
Born 16 December 1863, Madrid, Spain
Died 26 September 1952, Rome, Italy

https://en.wikiquote.org/wiki/George_Santayana
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Jared Diamond: Physiologist, biophysicist, ornithologist, environmentalist, historian, ecologist, geographer, evolutionary biologist, anthropologist & UCLA Professor
Born 10 September 1937, Boston, Mass
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PhD dissertation: Concentrating activity of the gall-bladder
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Born 21 March 1954, Boston, Mass
Instrumental in the successful control of air pollutants in the US using a cap and trade system
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https://www.youtube.com/watch?v=YCMi1xJ30g4
Climate Change: Science, Economics, and Governance

Additional readings:

- Global Warming: The Complete Briefing, Fifth Edition
  by John Houghton

- The Economics of Renewable Energy
  by David Timmons, Jonathan M. Harris, and Brian Roach

- The Economics of Global Climate Change
  by Jonathan M. Harris, Brian Roach, and Anne-Marie Codur

- Beyond Oil and Gas: The Methanol Economy
  Second Updated and Enlarged Edition

- A Brief History of Humankind
  by Yuval Noah Harari

- Paris Climate Agreement
  Beacon of Hope

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Organization Details: Assignments

- Admission Tickets (AT) (50%)
  - short set of questions, related to each reading; *due before the start of each class*
  - posted on web page; straightforward if reading has been done
  - graded on a 10 point basis; *lowest three scores will be dropped*

- First Paper (25%)
  - due **15 Nov** (Thurs before Thanksgiving) **BUT** can be completed **well** before due date!
  - 6 to 10 pages single spaced; must include references & can include figures, both of which are excluded from the page count
  - expands upon the topic of any class meeting, *other than* class meeting you have led

- Discussion Lead & Class Participation (10%)
  - each student will lead an hour long discussion during a specific class meeting
  - recorded (hopefully) w/ link to video posted on class webpage
  - evaluation from your peers and instructor
  - encouraged to meet with me to watch the video 😊
Organization Details: Assignments

• Final Paper / Renewable Energy Plan (15%)
  – last few weeks of class, students will break into three groups representing the Developed World, China, and the Least Developed Nations, with the assignment to formulate an energy plan for each entity that achieves the goal of the Paris Climate Agreement.
  – Energy plans will be presented Thurs, 6 Dec (last day of class)
  – Final paper, also due 6 Dec, shall reflect your view of the energy plan, defending or critiquing the plan from your perspective in the framing of the plan. You are welcome to also include commentary on the problems and/or success the real-world is having regarding a transition towards renewable energy.
    • Final paper should draw upon the body of material covered during the class as well as material you read for the project
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  - Those who cannot learn from history are doomed to repeat it.
Organization Details, Continued

• Readings
  – All readings are either from one of the two required books or will be posted on class webpage
  – Readings for next week, from Diamond’s book, will be available via handout
  – Copyright protected PDF files will be protected using password given out in class

• Additional Readings/Resources
  – Provided for many lectures on class webpage

• Email
  – Please use HONR229L at start of subject line of class-related email and please send emails to both Ross & Laura

• Office hours:
  – Ross (ATL 2403) : Mon & Wed 4:00 to 4:30 pm & by appointment
  – Laura (ATL 4100): By appointment
  – We strive to be accessible throughout the semester. Please either drop by or contact us via email to set up a time to meet
  – Ross is generally quite busy during the 30 mins just before the start of each class
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Electronic devices:

  Cell phones on mute
  Use laptop or iPad for taking notes is fine
  Use of laptop, iPad, or cell phone for non-class purpose prohibited without prior arrangement
Organization Details, Continued

• Typical class meeting (75 mins)
  – I’ll open with announcements, loose ends, and a motivational slide or two taken from the news, and review of prior Admission Tickets (~15 mins)
  – A student will lead a ~45 min discussion of the reading, using student prepared slides
  – I’ll provide a PowerPoint template *and* will be glad to review a draft prior to class
  – Every student will lead a single discussion: public speaking is a key element of a college education!
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  - Every student will lead a single discussion: **public speaking is a key element of a college education!**
  - I prefer to get student slides at least 30 mins before class via email
  - Arriving in this room a few mins early with slides on a memory stick is acceptable, but not preferable
  - We will use the room computer, because each meeting will be recorded
  - I am an easy grader … but completely dropping the ball on your presentation (i.e., arriving late, not showing up, etc) will be taken into consideration for final grade ⇒ we have the 10% participation component
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We are reasonable people … if something “comes up”, we can adjust. If you are having trouble putting your presentation together, Laura and I are here to help.
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  Again, we want you to lead a discussion, not lecture for 45 mins!
  Assume your classmates have done the reading!!
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In other words, we have 21 “book club” meetings …

I select the readings, each student will lead one discussion.
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I select the readings, each student will lead one discussion.

I’ll step in and facilitate if (when) appropriate … almost certainly more often than I should 😊
Science of Global Warming

1. The Climate Deniers (these days organized by Heartland Institute)
2. The Believers (these days personified by IPCC)

http://wattsupwiththat.com/2011/06/16/almost-friday-funny-ipccs-renewable-energy-cycle
Science of Global Warming

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2. The Believers (these days personified by IPCC)

http://incandescentplanetreflections.blogspot.com/2010_02_01_archive.html
Global Average Temperature and Carbon Dioxide Concentrations, 1880-2006

CO2 Concentration (ppmv)

Global Temperatures
CO2 (ice cores)
CO2 (Mauna Loa)

Year AD

Source: Michael Ernst, Woods Hole Research Center, from How We Know What We Know About Our Changing Climate

http://serc.carleton.edu/eslabs/carbon/3c.html
Correlation is not causation. However, science is clear that rising GHGs (mainly CO$_2$) are the cause of warming depicted on prior slide.
Tomorrow, Donald Trump will be inaugurated as 45th president of the United States. All the world will be watching as Trump is sworn in to the stylings of 3 Doors Down and associated acts.

It’s a painful moment for those who enjoyed The Hunger Games series but never envisioned it becoming their own reality. The timing couldn’t be worse, considering just this week, NOAA and NASA confirmed 2016 was the hottest year on record for the third year in a row—in case you forgot, Donald Trump has adamantly denied the existence of climate change, calling it “very expensive,” “bullshit,” and a “hoax.” He points to winter as proof that everyone smarter than him is wrong.

https://gizmodo.com/the-ten-most-horrifying-things-trump-has-said-about-cli-1791381328
Climate change policy toppled the government in Australia on Friday.

How much does that really matter?

It is certain to keep Australia from meeting its emissions targets under the Paris climate agreement.

It's also a glimpse into what a potent political issue climate change and energy policy can be in a handful of countries with powerful fossil fuel lobbies, namely Australia, Canada and the United States.

In Australia, the world's largest exporter of coal, climate and energy policy have infused politics for a decade, helping to bring down both liberal and conservative lawmakers.

This week, the failure to pass legislation that would have reined in greenhouse gas emissions precipitated Malcolm Turnbull's ouster as prime minister. He was elbowed out by Scott Morrison, an ardent champion of the Australian coal industry who is known for having brought a lump of the stuff to Parliament.

It could be a bellwether for next year's Canadian elections, expected in October, in which Prime Minister Justin Trudeau faces a powerful challenge from politicians aligned with the country's oil industry.

Conservatives have pledged to undo Mr. Trudeau's plans to put a price on carbon nationwide if they take power. At the provincial level, conservatives won a majority in Ontario after campaigning against the province's newly enacted cap-and-trade program.
Foreshadow of Discussion #4

Ending TPS for Haitians was unlawful — and racist, too

BY ELLIE HAPPEL

Haiti was, and is, the poorest country in the Western Hemisphere. In January 2010, in a matter of seconds, an earthquake killed more than 220,000 people and decimated much of Port-au-Prince, including public health and government institutions and infrastructure. Days later, DHS wisely designated Haiti for TPS. The unprecedented devastation wrought by the earthquake would soon be paired with another catastrophe of historic proportions. One of the deadliest cholera outbreaks in modern history erupted in October 2010 when negligent U.N. sanitation practices led to infected raw sewage being dumped into one of Haiti’s major rivers. Haiti’s already weak infrastructure, including a public health system still reeling after the quake, was overwhelmed by the scale of these disasters. Then, in 2015, Haiti was struck by the most powerful hurricane to reach its shores in half a century — Hurricane Matthew.

Even under the best of pre-disaster circumstances, recovery from major disasters — of the sort Haiti has endured three separate times since 2010 — can take many years. One example on U.S. territory is the ongoing effort to address the damage caused by hurricanes Katrina, Rita and Wilma. The DHS Disaster Relief Fund reported to Congress that for 2017, it would spend $439 million on relief efforts related to this trio of hurricanes, which made landfall in the continental United States 13 years ago. The challenges to effective reconstruction in Haiti are well documented, and include its lack of capacity to govern, a dearth of financial and human resources and U.S. foreign policy that preferred contracts for U.S. firms over inclusive, concrete progress in Haiti.

Haiti is not yet prepared to safely repatriate the 58,000 Haitian TPS holders and their families living in the United States. Forcing their return risks plunging our Caribbean neighbor into yet another crisis. And expelling them under these conditions due to racism demonstrates how little our nation has progressed.

https://www.miamiherald.com/opinion/op-ed/article217167695.html

See also https://www.cnn.com/2018/08/24/politics/trump-administration-tps-end/index.html

TPS: Temporary Protected Status
Summer 2018: Season of Fire

In the news:

How I spent my summer vacation: Fleeing wildfires as a climate change refugee

Carrie Scherpelz, Opinion contributor  Published 6:00 a.m. ET Aug. 25, 2018

As tourists, we could escape the smoke plumes, air quality alerts and forest fires. But climate change disasters will turn us all into nomads.

Our long-awaited trip to the Canadian Rockies this summer exceeded our expectations, but a lifetime in America's Midwest had not prepared us for the far-reaching effects of wildfires in the West.

Driving north from Spokane, Washington, we first noticed the low visibility and haze in the air. More than 500 wildfires were burning in British Columbia, but so far the Canadian National Parks remained open — unlike Yosemite National Park, parts of which were closed indefinitely due to fire.

Summer 2017: Season of Flood

Last year in the news:

Summer 2018: Local Flood

This year in the news:

Connection to Climate Change

WWDD: Wet-gets-Wetter, Dry-gets-Drier (WWDD) paradigm

Spatial Distribution of Precipitation Changes, 2081 –2100 relative to 1986–2005

Climate model projections, RCP 8.5 (aggressive growth of GHGs)

IPCC 2013

Connection to Climate Change

WWDD: Wet-gets-Wetter, Dry-gets-Drier (WWDD) paradigm

http://www.windows2universe.org/vocals/images/HadleyCell_small.jpg
Recent papers linking fires to climate change

Direct and indirect climate controls predict heterogeneous early-mid 21st century wildfire burned area across western and boreal North America

Trends in temperature for:
(a) Winter (JFM)
(b) spring (AMJ)
(c) summer (JAS)
over the 1972–2006 time period

This paper links increased burn area to warmer conditions during winter (mainly) and spring (secondary)

http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0188486&type=printable
Recent papers linking fires to climate change

**Decreasing fire season precipitation increased recent western US forest wildfire activity**

Zachary A. Holden,^a^ Alan Swanson^b^, Charles H. Luca^c^, W. Matt Jolly^d^, Marco Maneta^e^, Jared W. Oyler^f^, Dyer A. Warren^g^, Russell Parsons^d^, and David Affleck^d^

^a^US Forest Service Region 1, Missoula, MT 59807; ^b^School of Public and Community Health Sciences, University of Montana, Missoula, MT 59812; ^c^US Forest Service Aquatic Science Laboratory, Rocky Mountain Research Station, Boise, ID 83702; ^d^US Forest Service, Fire Sciences Laboratory, Rocky Mountain Research Station, Missoula, MT 59808; ^e^Department of Geosciences, University of Montana, Missoula, MT 59812; ^f^Earth and Environmental Systems Institute, Pennsylvania State University, University Park, PA 16802; and ^g^Department of Forestry and Conservation, University of Montana, Missoula, MT 59812

This paper concludes declines in summer precipitation and wetting rain days have likely been a primary driver of increases in wildfire area burned, and points to future climate projections that predict further decreases in summer precipitation and longer dry periods between rain events across much of the West.

[http://www.pnas.org/content/early/2018/08/14/1802316115](http://www.pnas.org/content/early/2018/08/14/1802316115)
Recent papers linking fires to climate change

Holden et al’s new PNAS paper on western US wildfire claims to be the first to analyze summer precip trends and impact on fire. But this is not true: Kitzberger et al 2017 did this with more data, finer spatial resolution, over a larger region:

Direct and indirect climate controls predict heterog...
Predicting wildfire under future conditions is complicated by complex interrelated drivers operating across large spatial scales. Annual area burned (AAB) is a useful ...
journals.plos.org

12:54 PM - 25 Aug 2018 from California, USA

8 Retweets 15 Likes

Tom Swetnam @Tom_Swetnam · Aug 25
Replying to @LeroyWesterling
See figure S1 in supp materials of Kitzberger et al. There, spring vs summer precip trends are not consistent. Note significance levels. Contrast this with Holden et al. findings. Possible confounding of different seasonal trends, diff regional patterns, diff time periods tested?

A. LeRoy Westerling @LeroyWesterling · Aug 25
Also: holden et al use a shorter data set, set a low bar for significance and don’t use a method that accounts for outliers near end points in a short data set. This is especially important for precipitation
Next Meeting: Thursday

Admission Ticket #0 (AT 0 on website) prior to **12:25 pm on Thurs**

1) Where do you stand on the climate change debate? (2 pts)

In other words, are you a Believer, a Denier, or Unsure? In addition to stating where you stand on the debate, please expound upon your standing in two to three sentences.

2) On a scale of 1 to 10, 1 being least important and 10 being most important, what priority should the United States government give towards curbing our nation's emissions of fossil fuels over the course of your lifetime, such that by year 2060, half of all energy in the U.S. would be achieved by renewable sources and/or nuclear reactors? (3 pts)

Please note:
• such a large scale transition to renewable energy will undoubtedly cause some economic disruption; the amount is hotly debated
• by renewable source, we mean technologies such as solar, wind, hydro, biofuels, even carbon capture and sequestration
In addition to stating the priority level, support your reply with two to three additional sentences.

3) In terms of curbing dire effects of climate change at an international level, which of the following four factors do you think is most important:

1. designing living spaces in a sustainable manner (so that cars are not essential, locally sourced food can be consumed, etc)
2. generating electricity in a manner that releases little to no greenhouse gases to the atmosphere
3. changing our dietary preferences to minimize the consumption of meat, especially red meat
4. limiting population growth and ultimately reducing global population levels

Please select one of the replies and follow with a sentence or 2 (as most 3 sentences) that support your choice.

Please note there is not any wrong answer to this question and you will get full credit if you complete the assignment as request: i.e., pick 1 of the 4 possible answers and support this selection with a coherent sentence (or 2 or 3)

We will share some of the replies in class, but in a manner that preserves student anonymity.

Please complete on ELMS prior to 12:25 pm on 30 August or email your reply to rjs@atmos.umd.edu & mcbridel@terpmail.umd.edu by this deadline
HONR 229L: Climate Change: Science, Economics, and Governance

Class Discussion Lead Poll

Please indicate your name ____________________

and the number of the class discussion you’d like to lead:

First choice: ____
Second choice: ____
Third choice: ____
Fourth choice: ____
Fifth choice: ____

Please note your paper must be based on a class meeting other than the discussion you lead.

We will make every effort to assign 1 of your top 5 choices.

This is due at start of second class meeting, 30 August
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/28</td>
<td>Class Overview</td>
<td>None</td>
<td>Salawitch A</td>
</tr>
<tr>
<td>08/30</td>
<td>Overview of Climate Change</td>
<td>None, but please complete AT</td>
<td>Salawitch B</td>
</tr>
<tr>
<td>09/04</td>
<td>Past Societies, Failure: Easter Island</td>
<td>Diamond: Ch 2 (41 pages)</td>
<td>Discussion 1</td>
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<tr>
<td>09/06</td>
<td>Past Societies, Failure: The Maya</td>
<td>Diamond: Prologue (24 pages) &amp; Ch 5 (21 pages)</td>
<td>Discussion 2</td>
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<tr>
<td>09/11</td>
<td>Past Societies, Success: New Guinea, Tikopia &amp; Japan</td>
<td>Diamond: Ch 9 (32 pages)</td>
<td>Discussion 3</td>
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<tr>
<td>09/13</td>
<td>Modern Societies: Dominican Republic and Haiti</td>
<td>Diamond: Ch 11 (29 pages)</td>
<td>Discussion 4</td>
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<td>09/18</td>
<td>Modern Societies: China</td>
<td>Diamond: Ch 12 (20 pages)</td>
<td>Discussion 5</td>
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<td>09/20</td>
<td>Roadmaps for Success or Failure</td>
<td>Diamond: Ch 14 (22 pages)</td>
<td>Discussion 6</td>
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<tr>
<td>09/25</td>
<td>Business and the Environment</td>
<td>Diamond: Ch 15 (41 pages)</td>
<td>Discussion 7</td>
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<td>09/27</td>
<td>Introduction to Climate Change</td>
<td>IPCC 2007 FAQ (36 pages)</td>
<td>Discussion 8</td>
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<td>10/02</td>
<td>Climate Models: Perspective of a Physical Scientist</td>
<td>Houghton, Ch 5 (37 pages)</td>
<td>Discussion 9</td>
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<tr>
<td>10/04</td>
<td>Climate Models: Perspective of a Social Scientist</td>
<td>Nate Silver: Ch 12 (42 pages)</td>
<td>Discussion 10</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading Material</td>
<td>Discussion</td>
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<tr>
<td>10/09</td>
<td>Impacts of Climate Change</td>
<td>Union of Concerned Scientists Climate Reality Project</td>
<td>Discussion 11</td>
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<tr>
<td>10/11</td>
<td>Solar Energy</td>
<td>Krupp &amp; Horn: Ch 2 (30 pages) <em>or</em> Krupp &amp; Horn: Ch 3 (29 pages)</td>
<td>Discussion 12</td>
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<td>10/16</td>
<td>Biofuels</td>
<td>Krupp &amp; Horn: Ch 4 &amp; 5 (45 pages)</td>
<td>Discussion 13</td>
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<td>10/18</td>
<td>Hydro, Geo &amp; Wind</td>
<td>Olah: Secs 8.1 to 8.4 (24 pages)</td>
<td>Discussion 14</td>
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<td>10/23</td>
<td>The Capitalist Creed (Fascinating Essay on Money)</td>
<td>Harari, Chapter 16 (33 pages)</td>
<td>Discussion 15</td>
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<td>10/25</td>
<td>The Economics of Renewable Energy</td>
<td>Tufts GDAE Doc 1 (26 pages)</td>
<td>Discussion 16</td>
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<td>10/30</td>
<td>The Economics of Climate Change, Part 1</td>
<td>Tufts GDAE Doc 2 (28 pages)</td>
<td>Discussion 17</td>
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<td>11/01</td>
<td>The Economics of Climate Change, Part 2</td>
<td>Tufts GDAE Doc 2 (15 pages)</td>
<td>Discussion 18</td>
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<td>11/06</td>
<td>Possible Solutions</td>
<td>Krupp &amp; Horn: Ch 9 (43 pages)</td>
<td>Discussion 19</td>
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<td>11/08</td>
<td>The Paris Climate Agreement</td>
<td>Ch 3, Paris Beacon of Hope (37 pages)</td>
<td>Discussion 20</td>
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<td>11/13</td>
<td>Implementation of the Paris Climate Agreement</td>
<td>Ch 4, Paris Beacon of Hope (40 pages)</td>
<td>Discussion 21</td>
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Next Meeting: Thursday

Reading:

None!

Please complete:

• Admission Ticket #0 (AT 0 on website) prior to 12:25 pm on Thurs

• Discussion leader preference survey: complete and bring to class at start of class

• At start of class, we will go around the room, with each student stating how they aspire, during their professional career, to make the world a better place

• Rest of class on Thurs will be a traditional lecture, entitled Overview of Climate Change (no reading)