

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

## Meeting #1: Class Overview

Ross Salawitch [rjs@atmos.umd.edu](mailto:rjs@atmos.umd.edu)

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

**ELMS Page:** <https://myelms.umd.edu/courses/1269254>



A boat navigates next to large icebergs near the town of Kulusuk, in eastern Greenland. Greenland's ice has been melting for more than 20 years, but the pace has picked up in 2019. (Felipe Dana/Associated Press)

<https://www.latimes.com/environment/story/2019-08-20/greenlands-glaciers-are-melting>

**27 August 2019**

# 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

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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."

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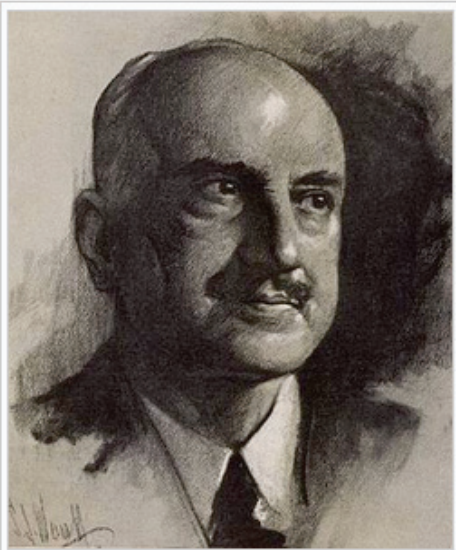
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
[https://en.wikiquote.org/wiki/George\\_Santayana](https://en.wikiquote.org/wiki/George_Santayana)

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Those who cannot remember the past are condemned to repeat it. 

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

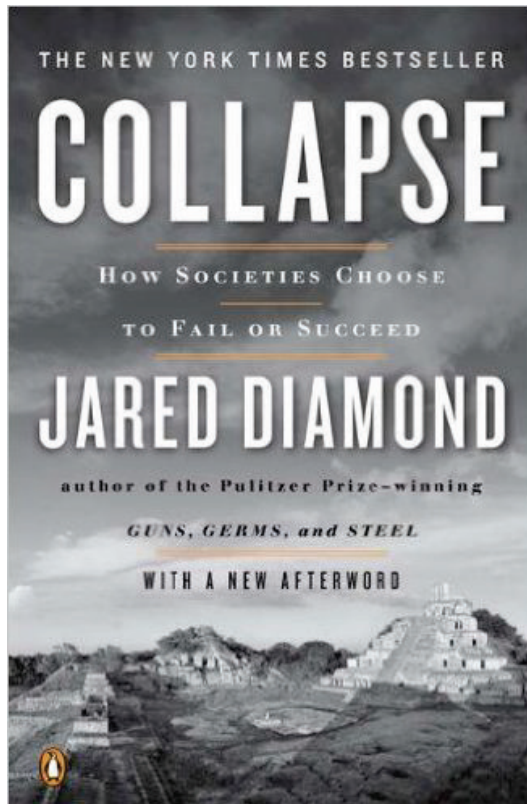
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Jared Diamond: Physiologist, biophysicist, ornithologist, environmentalist, historian, ecologist, geographer, evolutionary biologist, anthropologist & UCLA Professor  
Born 10 September 1937, Boston, Mass

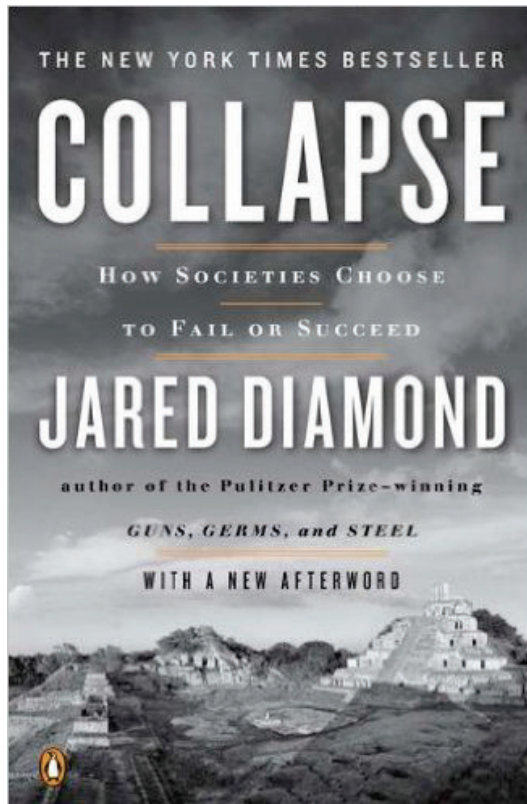


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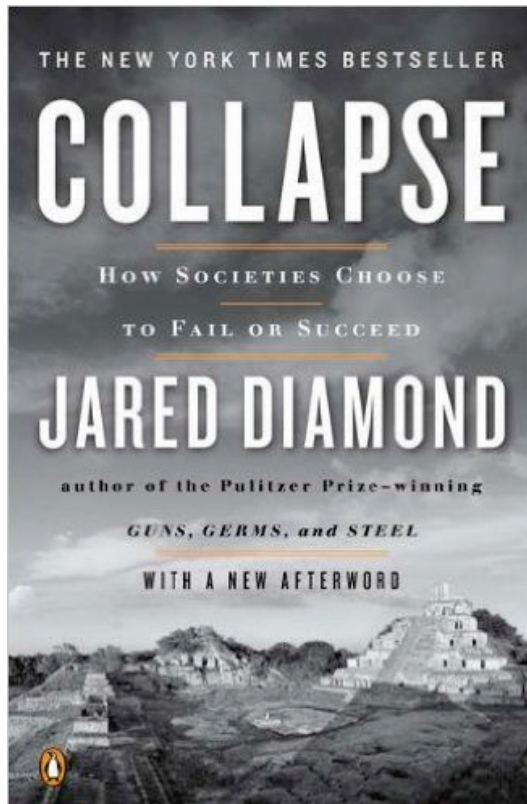


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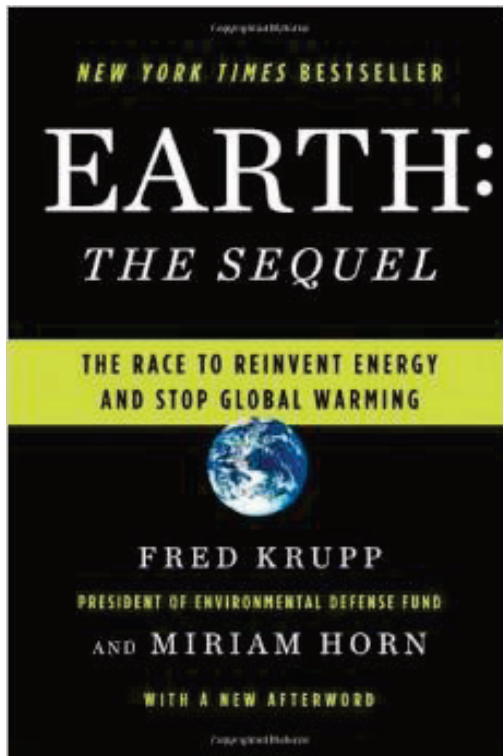


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president of the Environmental Defense Fund  
Born 21 March 1954, Boston, Mass  
Instrumental in the successful control of air pollutants in the US  
using a cap and trade system

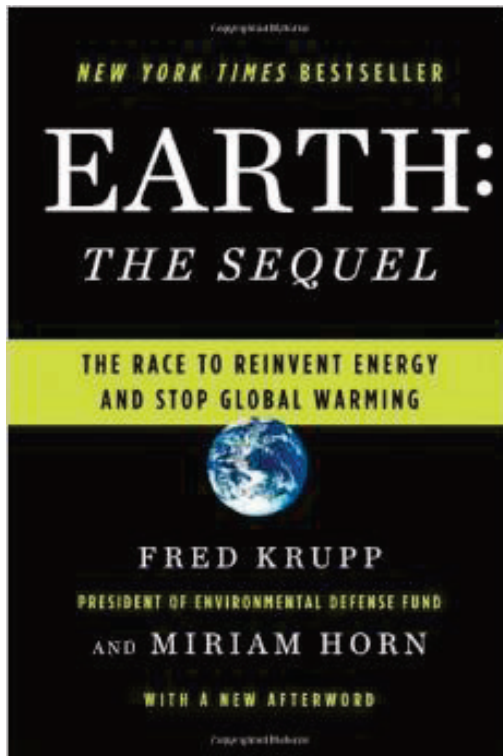


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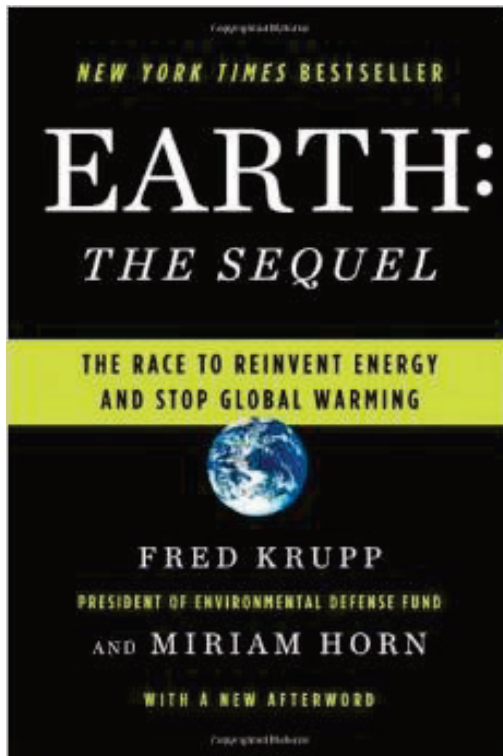


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YouTube

<https://www.youtube.com/watch?v=YCMi1xJ30g4>



# Climate Change: Science, Economics, and Governance

## Additional readings:

From the report accepted by Working Group I of the Intergovernmental Panel on Climate Change but not approved in detail

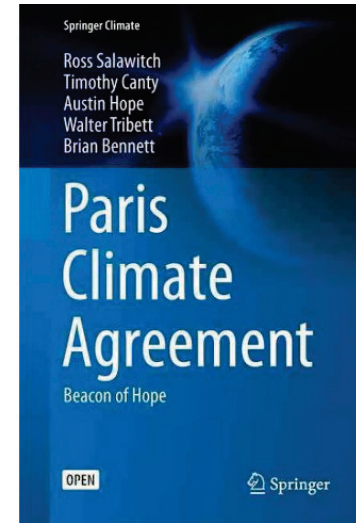
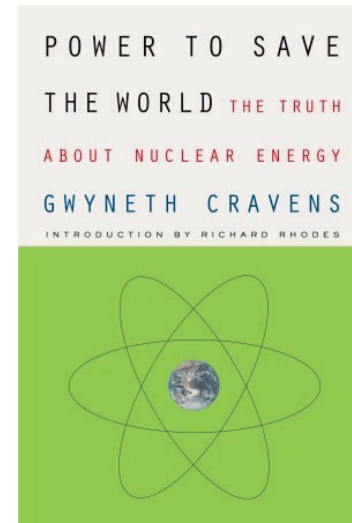
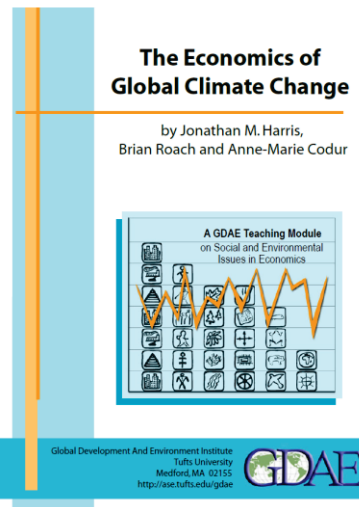
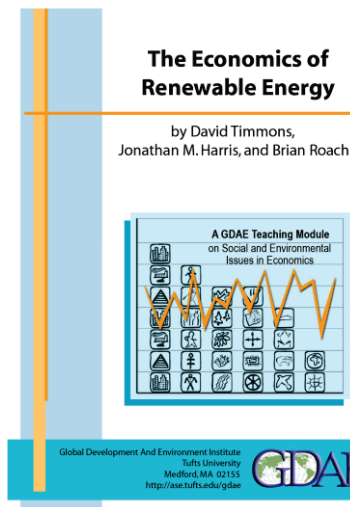
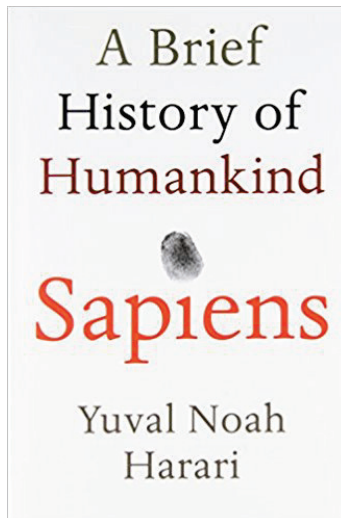
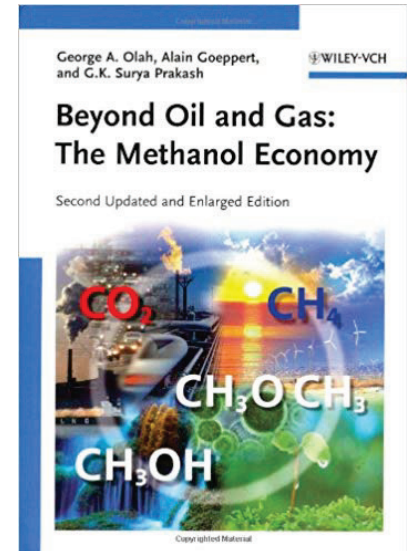
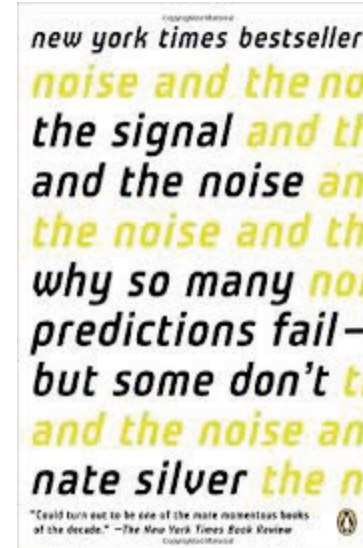
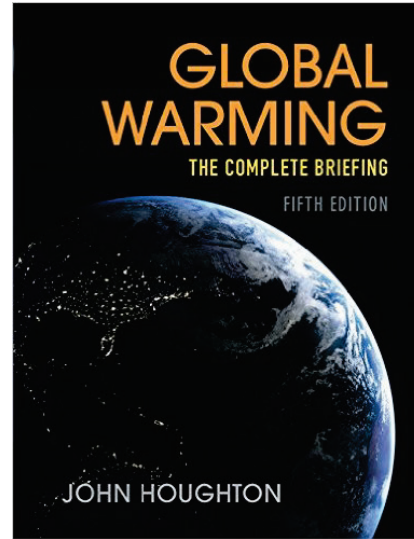
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**Frequently Asked Questions**

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**FAQ Citation:**  
These Frequently Asked Questions have been taken directly from the chapters of the underlying report and are collected here. When referencing specific FAQs, please reference the corresponding chapter in the report from whence the FAQ originated.

**When referencing the group of FAQs, please cite as:**  
IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.




# 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 **14 Nov** BUT can be completed well before due date!
  - 5 to 8 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 or will lead, or explores some other topic related to class
- 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, 5 Dec
  - Final paper, due Mon, 9 Dec (last day of class), 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 because every day I receive a large number of emails***
  - Fine to also use ELMS discussion tool ... which I'll be using for the first time
- Office hours:
  - Ross (ATL 2403) : Mon & Wed 4:00 to 4:30 pm & 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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  - **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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**I'm a reasonable person ... if something "comes up", I can adjust.  
If you are having trouble putting your presentation together,  
I am here to help.**

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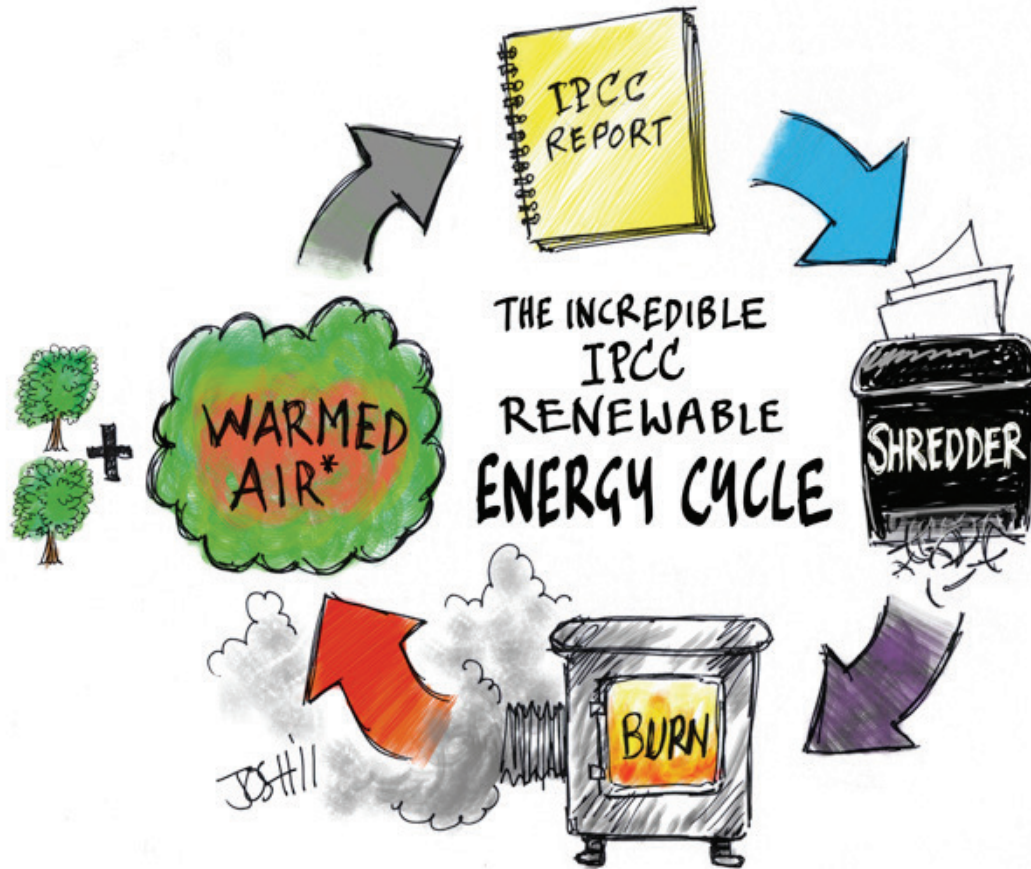
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**I select the readings, each student will lead one discussion.**

**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)



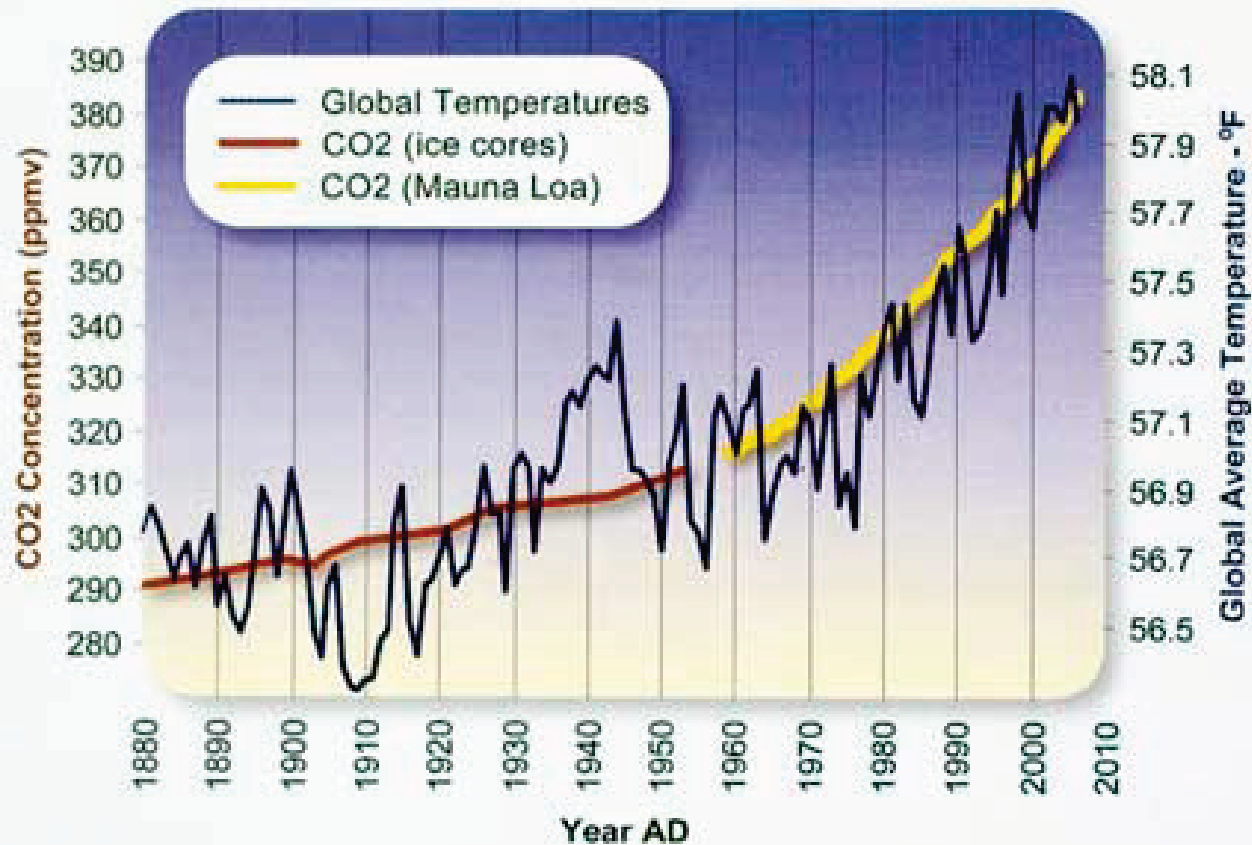
\*PAL REVIEWED GREENPIECE-OF-THE-ACTION SCIENCE

<http://wattsupwiththat.com/2011/06/16/almost-friday-funny-ipccs-renewable-energy-cycle>





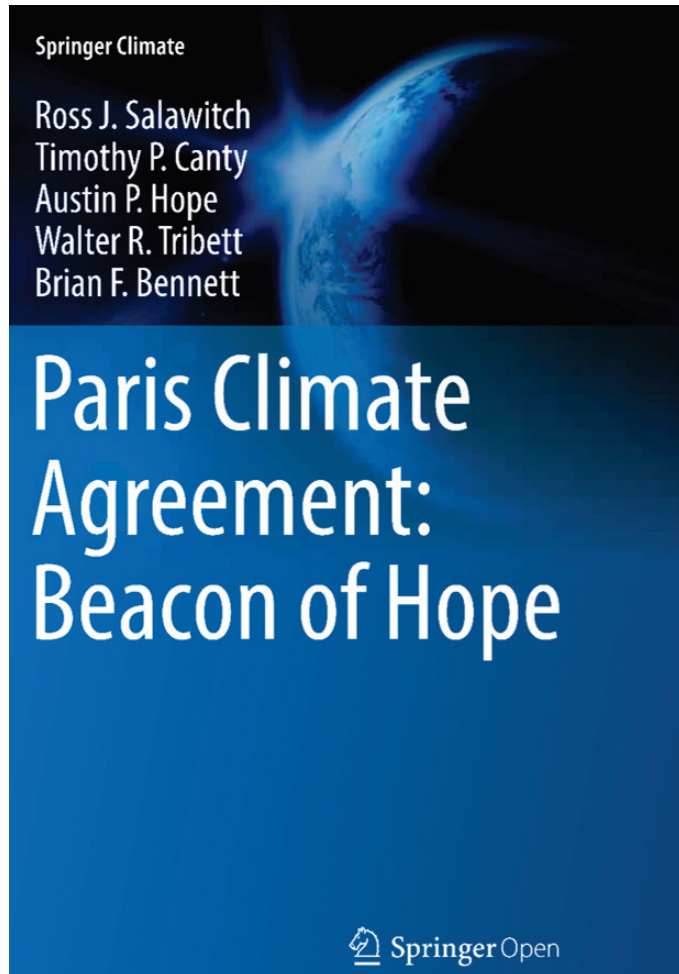
# Global Average Temperature and Carbon Dioxide Concentrations, 1880-2006



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<sub>2</sub>) are the cause of warming depicted on prior slide



## Chapter 1 Earth's Climate System

Ross J. Salawitch, Brian F. Bennett, Austin P. Hope,  
Walter R. Tribett, and Timothy P. Canty

**Abstract** This chapter provides an overview of the factors that influence Earth's climate. The relation between reconstructions of global mean surface temperature and estimates of atmospheric carbon dioxide (CO<sub>2</sub>) over the past 500 million years is first described. Vast variations in climate on geologic time scales, driven by natural fluctuations of CO<sub>2</sub>, are readily apparent. We then shift attention to the time period 1765 to present, known as the Anthropocene, during which human activity has strongly influenced atmospheric CO<sub>2</sub>, other greenhouse gases (GHGs), and Earth's climate. Two mathematical concepts essential for quantitative understanding of climate change, radiative forcing and global warming potential, are described. Next, fingerprints of the impact of human activity on rising temperature and the abundance of various GHGs over the course of the Anthropocene are presented. We conclude by showing Earth is in the midst of a remarkable transformation. In the past, radiative forcing of climate represented a balance between warming due to rising GHGs and cooling due to the presence of suspended particles (aerosols) in the troposphere. There presently exists considerable uncertainty in the actual magnitude of radiative forcing of climate due to tropospheric aerosols, which has important consequences for our understanding of the climate system. In the future, climate will be driven mainly by GHG warming because aerosol precursors are being effectively removed from pollution sources, due to air quality legislation enacted in response to public health concerns.

**Keywords** Paleoclimate • Anthropocene • Global warming • Greenhouse gases • Radiative forcing

Can download for free from <https://link.springer.com/book/10.1007/978-3-319-46939-3>

# Climate, Politics, Energy, and Money

26 Aug 2019



ANWR: Arctic National Wildlife Refuge  
[https://en.wikipedia.org/wiki/Arctic\\_Refuge\\_drilling\\_controversy](https://en.wikipedia.org/wiki/Arctic_Refuge_drilling_controversy)

<https://twitter.com/CBSNews/status/1166078002939256834>

# Deforestation, Politics, Climate, and Money

24 Aug 2019

## Fires raging at record rate in Brazil's Amazon rainforest

According to Brazil's National Institute for Space Research (INPE):

- 72,800 fires, an 80% increase compared with the same period last year
- more than 1 and 1/2 soccer fields of Amazon rainforest being destroyed every minute of every day

Amazon is home to:

- enormous number species of fauna and flora: 30% of plants endemic to Brazil
- 900,00 indigenous peoples living in more than 300 tribes

Environmental groups blame Brazil's president Jair Bolsonaro for endangering the Amazon; his pro-business stance has emboldened loggers, farmers & miners to seize control of increasing areas of the Amazon

<https://www.wbaltv.com/article/brazil-s-amazon-rainforest-is-burning-at-a-record-rate-research-center-says/28770579>



2,050,490 views



CNN  
Published on Aug 22, 2019

Fires are raging at a record rate in Brazil's Amazon rainforest, and scientists warn that it could strike a devastating blow to the fight against climate change.

The fires are burning at the highest rate since the country's space research center, the National  
SHOW MORE

11,465 Comments    SORT BY

<https://www.youtube.com/watch?v=kA7opFdGs7g>

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SCIENTIFIC AMERICAN.

## Brazil's Sacked Space Director Speaks Out on Attacks on Science

Ricardo Galvão discusses his dismissal after Amazon deforestation data rankled President Bolsonaro

Fires from slash-and-burn deforestation obscure the Amazon rain forest along the Xingu River in Brazil, in this photo taken by astronauts aboard the International Space Station

<https://www.scientificamerican.com/article/brazils-sacked-space-director-speaks-out-on-attacks-on-science>

# Greenland, Sea Level Rise, Arctic Sea Ice

20 Aug 2019

By Seth Borenstein

HELHEIM GLACIER, Greenland — This is where Earth's refrigerator door is left open, where glaciers dwindle and seas begin to rise.

New York University air and ocean scientist David Holland, who's been tracking Greenland from above and below, calls it "the end of the planet." He's referring to geography, not making an apocalyptic prediction. Yet in many ways, this spot just inside the Arctic Circle is where the planet's warmer and watery future is being written.

It is so warm here that on an August day, coats are left on the ground and Holland and colleagues work on the watery melting ice without gloves. In one of the closest towns, Kulusuk, the morning temperature reached 52 degrees Fahrenheit — warm enough for shirtsleeves.

The ice Holland is standing on is thousands of years old. Scientists say it will be gone within a year or two, adding yet more water to rising seas worldwide.

Summer this year is hitting Greenland hard with record-shattering heat and extreme melt. Between July 31 and August 3 alone, more than 58 billion tons melted from the surface. The average for this time of year is less than 18 billion tons. And that doesn't even count the huge calving events or the warm water eating away at the glaciers from below. By season's end, about 440 billion tons of ice — maybe more — will have melted or calved off Greenland's giant ice sheet, experts estimate. That's enough to flood **the entire state of Pennsylvania under water about a foot deep.**

<https://www.latimes.com/environment/story/2019-08-20/greenlands-glaciers-are-melting>

# Greenland, Sea Level Rise, Arctic Sea Ice

20 Aug 2019



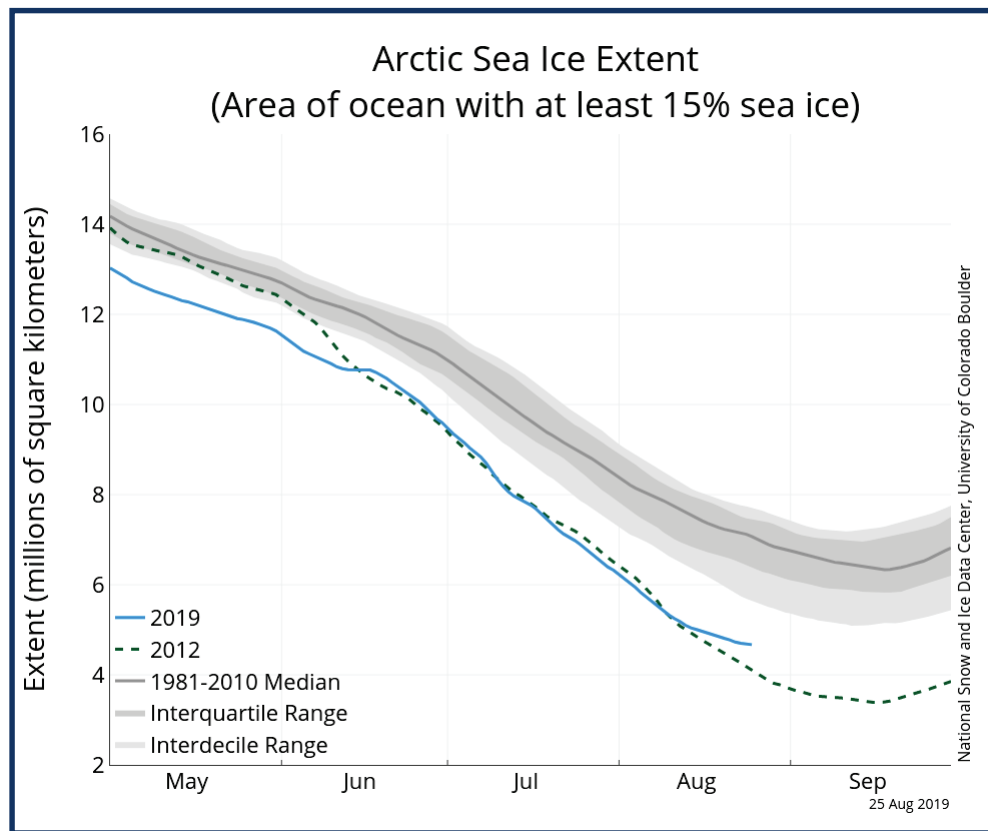
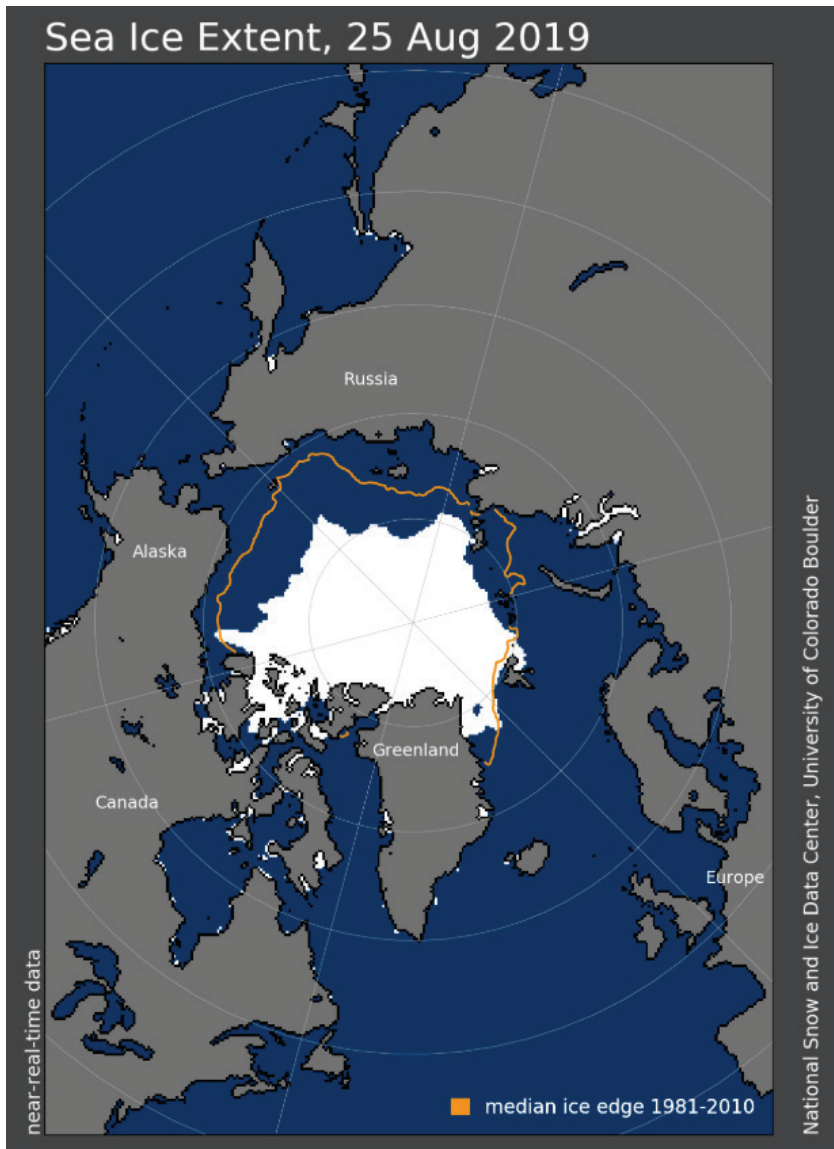
A helicopter sits on the Greenland ice as New York University scientist David Holland and his team install a radar and GPS at the Helheim glacier. (Felipe Dana/Associated Press)

<https://www.latimes.com/environment/story/2019-08-20/greenlands-glaciers-are-melting>



# Greenland, Sea Level Rise, Arctic Sea Ice

25 Aug 2019



<https://nsidc.org/arcticseaicenews/>

# Microcosm of HONRL 229L: Indonesia will build its new capital city in Borneo as Jakarta sinks into the Java Sea

by Rob Picheta

**26 Aug 2019**

(CNN) — A jungled area on the east of Borneo island is set to be transformed into Indonesia's new capital city, President Joko Widodo announced Monday, amid concerns over the sustainability of its congested and **rapidly sinking political center Jakarta.**

Indonesia owns the majority of Borneo, the world's third-largest island, with Malaysia and Brunei each holding parts of its northern region. The island is covered in vast rainforests, but has been hit by rampant deforestation in recent years.

The project will likely cost around 486 trillion rupiah (\$34 billion) and officials have previously said the relocation could take around 10 years. No name has been given for the new site; the move now requires parliamentary approval to be given the go-ahead.

Jakarta has an estimated 30 million in the greater metropolitan area -- making it one of the world's most overpopulated urban regions. The city sits on swampy ground and **hugs the sea to the north,** making it especially prone to flooding. It's also one of the fastest-sinking cities on earth, dropping into the Java Sea at an alarming rate **due to**

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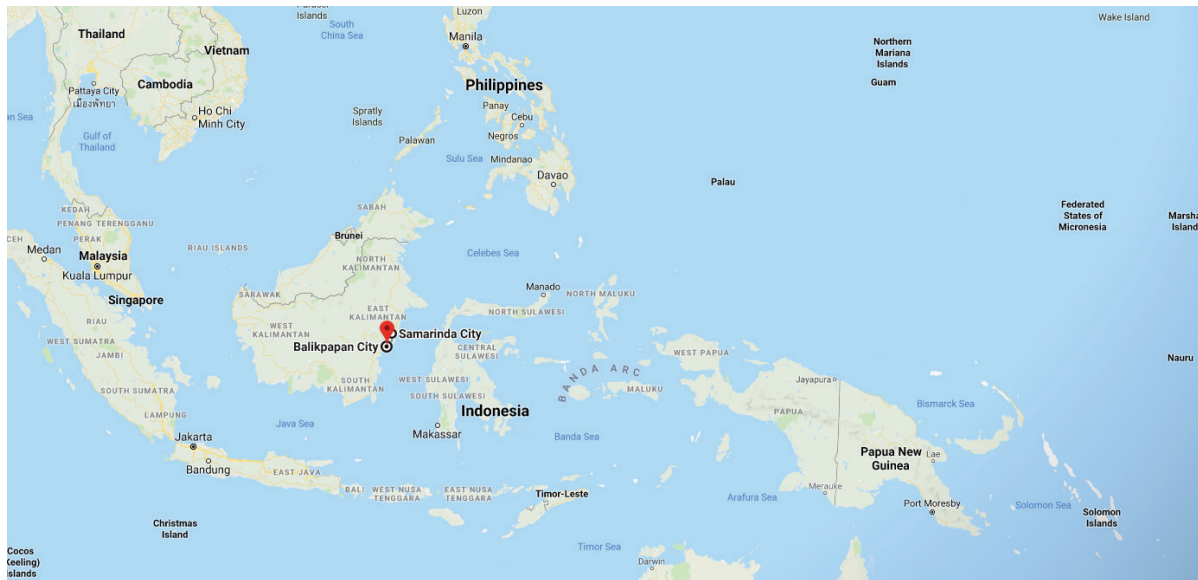
TOP 10 MOST POPULOUS COUNTRIES (July 1, 2019)

1. China	1,389,618,778	6. Brazil	210,301,591
2. India	1,311,559,204	7. Nigeria	208,679,114
3. United States	331,883,986	8. Bangladesh	161,062,905
4. Indonesia	264,935,824	9. Russia	141,944,641
5. Pakistan	210,797,836	10. Mexico	127,318,112

<https://www.census.gov/popclock>

# Microcosm of HONRL 229L: Indonesia will build its new capital city in Borneo as Jakarta sinks into the Java Sea

26 Aug 2019



# 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 29 August or  
email your reply to [rjs@atmos.umd.edu](mailto:rjs@atmos.umd.edu)  
by this deadline

Date	Topic	Reading	Meeting
08/27	Class Overview	None	Ross
08/29	Overview of Climate Change	<b>None, but please complete AT</b>	Ross
09/03	Past Societies, Failure: Easter Island	Diamond: Ch 2 (41 pages)	Discussion 1
09/05	Past Societies, Failure: The Maya	Diamond: Prologue (24 pages) & Ch 5 (21 pages)	Discussion 2
09/10	Past Societies, Success: New Guinea, Tikopia & Japan	Diamond: Ch 9 (32 pages)	Discussion 3
09/12	Modern Societies: Dominican Republic and Haiti	Diamond: Ch 11 (29 pages)	Discussion 4
09/17	Modern Societies: China	Diamond: Ch 12 (20 pages)	Discussion 5
09/19	Roadmaps for Success or Failure	Diamond: Ch 14 (22 pages)	Discussion 6
09/24	Business and the Environment	Diamond: Ch 15 (41 pages)	Discussion 7
09/26	Introduction to Climate Change	IPCC 2007 FAQ_(36 pages)	Discussion 8
10/01	Climate Models: Perspective of a Physical Scientist	<a href="#">Houghton, Ch 5</a> (37 pages)	Discussion 9
10/03	Climate Models: Perspective of a Social Scientist	<a href="#">Nate Silver: Ch 12</a> (42 pages)	Discussion 10

10/08	Impacts of Climate Change	<a href="#">Union of Concerned Scientists Climate Reality Project</a>	Discussion 11
10/10	Solar Energy	Krupp & Horn: Ch 2 (30 pages) *or* Krupp & Horn: Ch 3 (29 pages)	Discussion 12
10/15	Biofuels	Krupp & Horn: Ch 4 & 5 (45 pages)	Discussion 13
10/17	Hydro, Geo & Wind	<a href="#">Olah: Secs 8.1 to 8.4</a> (24 pages)	Discussion 14
10/22	Nuclear Energy	Olah, <a href="#">Sec 8.8</a> (16 pages) Cravens, <a href="#">Ch 16 &amp; 17</a> (32 pages)	Discussion 15
10/24	The Capitalist Creed (Fascinating Essay on Money)	Harari, Chapter 16 (33 pages)	Discussion 16
10/29	The Economics of Renewable Energy	<a href="#">Tufts GDAE Doc 1</a> (26 pages)	Discussion 17
10/31	The Economics of Climate Change, Part 1	<a href="#">Tufts GDAE Doc 2</a> (43 pages)	Discussion 18
11/05	Possible Solutions	Krupp & Horn: Ch 9 (43 pages)	Discussion 19
11/07	The Paris Climate Agreement	<a href="#">Ch 3, Paris Beacon of Hope</a> (37 pages)	Discussion 20
11/12	Implementation of the Paris Climate Agreement	<a href="#">Ch 4, Paris Beacon of Hope</a> (40 pages)	Discussion 21



# 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, 29 August

# 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)