THE *LEAD FOR THE PLANET* HANDBOOK

Exercises, Media, and Projects on Climate Leadership

by

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Updated December 26, 2020

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# Introduction

Innovative leaders today are working in and across societal sectors—including businesses, governments, non-profits, communities, and families—to create systemic approaches to climate change. This handbook is one of three publications I have developed to support both climate leaders and teachers of climate leadership. It aligns with the leadership model I use in my trade book [Lead for the Planet: Five Practices for Confronting Climate Change](https://utorontopress.com/us/lead-for-the-planet-2) (University of Toronto Press, 2020). The third publication in this series is a peer-reviewed article describing the rationale for and details of an online course on climate leadership: [Teaching Climate Leadership: Promoting Integrative Learning in Courses on Strong Sustainability](https://journals.sagepub.com/doi/abs/10.1177/1052562920941547) (*Journal of Management Education*, 2020).

Courses on leadership and sustainability are taught in business schools and environmental studies programs, as well as in a variety of interdisciplinary settings. Whatever the venue, students should be encouraged to challenge, and make their own, crucial narratives about climate change. Therefore, it is important that they have every opportunity to discuss, present, and debate the ideas presented in this series. This supplement offers many classroom-tested pedagogical approaches that help develop such skills.

I particularly want to acknowledge the help of Pamela Weir, of the Management and Organizational Development Group at Northeastern University, in working on climate change over many semester years, and most recently in finalizing this Handbook. Pamela’s leadership, care and support for addressing environmental issues has been phenomenal and continual. Thank you!

# The Goals of This Handbook

This informally formatted handbook presents pedagogical materials for a university course on climate leadership. For a decade, I have taught climate leadership in undergraduate and graduate programs in business schools and in a university-wide honors program.

The course promotes:

1. planetary sustainability
2. systemic leadership
3. action grounded in a variety of disciplines.

Planetary sustainability means leaving to future generations the option and the capacity to be as well off as we are today. Planetary sustainability is increasingly referred to as *strong sustainability*, and it requires change across planetary systems. By contrast, *weak sustainability* focuses on isolated local action, and often refers to company efforts to be sustainable while giving little consideration to the planet. Of course, thinking about the planet as a whole is a complicated endeavor. Therefore, this course focuses on climate change and energy evolution, and leaves to others the simultaneously critical issues of population growth and agricultural development.

Sustainability courses typically begin with basic science and a recognition of climate problems, and then move on to potential solutions. Too often I am left waiting for the most important step – the step of action, including the recommendation of exactly what to do next. When the conversation turns toward leadership, I become hopeful.

In this spirit, this course promotes *systemic leadership*. Leadership is a psychological concept that involves motivating oneself and others. What is the vision, and exactly who will do exactly what? Systemic leadership promotes motivation within sectors and institutions, based on ethical perspectives of change and justice. It promotes change *across* the planet *for* the planet.

Teaching this course requires making a commitment to broad-ranging thinking and action. I believe that if we are going to solve real-world problems we must adapt an interdisciplinary approach. When it comes to addressing climate and energy concerns, this means that business professors are going to have to learn something about science, and science professors are going to have to learn something about leadership. (Yes, they can also collaborate in the classroom, but such collaborations tend to be cumbersome and short-lived.) Both must move beyond narrow academic theories to consider issues of social policy and energy innovation. By learning and expanding their own perspectives, individual but interdisciplinary professors will not only teach their students intellectually, they will model the kind of leadership for the planet that we need now.

# Welcome to Team Humanity

## Exercises

### Natural World Awareness

*Length:* 20-30 minutes

*Instructions:*

In this exercise, “the natural world” refers to nature and natural phenomena.

Form concentric circles of 8-12 people that face each other. After each question, the outside group rotates one position.

1. Describe the relationship you have on a daily basis with the natural world
2. describe your earliest memory of the natural world
3. describe a situation in which you enjoyed the natural world
4. describe a situation in which you felt uncomfortable in the natural world
5. describe the relationship of humanity and the natural world today

*Discussion:*

What did you learn about yourself here?

What made you comfortable or uncomfortable?

What did you learn about how others view the natural world?

How might different attitudes to the natural world affect your interest in environmental leadership? How might different attitudes to the natural world affect your ability to lead for the environment?

*Learning goals:*

1. to explore different attitudes toward the natural world
2. to identify patterns in these attitudes in our class
3. to develop our appreciation for the natural world
4. to develop an understanding of different experiences with the natural world

Inspired by G. Coombs and Y. Sarason, “Culture Circles: A Cultural Self Awareness Exercise,” *Journal of Management Education* *22* (2) April 1998: 218-226.

### Icebreaker: Connected With the Planet?

*Length:* 15 minutes

*Instructions:*

Find someone who fits a description in one of the squares below (introduce yourself) and have them sign their name in the square. You may get more than one signature in each box, but o*nly two signatures from each person!*  Try to get all the boxes filled with signatures.

ICEBREAKER

WRITE DOWN THE NAMES OF YOUR CLASSMATES WHO QUALIFY IN EACH BLOCK! SEE IF YOU CAN FILL THE WHOLE PAGE!

|  |  |  |
| --- | --- | --- |
| Has travelled above the Arctic circle (or to Antarctica) | Has changed an important life goal because of a sustainability concern | Has purchased carbon offsets for flights |
| Has dived the Great Barrier reef | Is certain that humans are causing global warming | Has swum in the wild with whales or dolphins |
| Practices “catch and release” | Is a lifetime member of a conservation organization | Has friends or family in agribusiness |
| Has climbed a mountain >1000m | Donates to a nonprofit that focuses on sustainability | Has travelled to the Serengeti |
| Has slept in a tent for a week or more (consecutively!) | Has hiked above 14,000 feet | Volunteers for an organization that promotes green practices |
| Grew up on a farm | Enjoys survival programs and nature documentaries | Loves gardening |

*Discussion:*

How many blocks did you fill? What did you learn about your classmates’ experience? What do you have in common with them? How is your experience different?

*Learning Goals:*

Understand the depth of classmates’ experience of the natural world.

Begin to connect the class’s experience with its curiosity and knowledge about the natural world.

Get to know the instructor’s experience of the natural world. (This handout reflects the experience of this author. Instructors may want to substitute their own experiences. “Now you know something about who I am and why I am teaching this course.”)

### Are You Thinking in Systems?

*Length:* 20-30 minutes

1. In three minutes, list all the ways in which you yourself are taking concrete steps to prevent climate change.
2. Share your responses with a teammate and together rate each of them according to which level of change they address.

*Level 1:* Small household changes (such as…using cloth napkins)

*Level 2:* Large household changes (installing solar panels, becoming vegetarians)

*Level 3:* Small changes in your work organization, or school (using disposable utensils)

*Level 4:* Large changes in your work organization, or school (installing a heat pump to replace burning gas)

*Level 5:* Making changes locally in your community (lobbying for all-green electricity in your town)

*Level 6:* Making changes in your industry (lobbying an industry association to set an industry standard for materials disposal)

*Level 7:* Supporting a politician who advocates for specific policies to address climate change.

1. How many responses did you have at each level?
2. At which level did you take a leadership role?

## Media

### Wilderness: The Great Debate

Argues credibly that wilderness is needed for nourishing the human spirit, maintaining the pride of the nation, and symbolizing the ability to plan for a sustainable future.

This video is very good for initiating a balanced discussion between green advocates and other recreational users, as most of the stakeholders are portrayed as well-intentioned. However, its focus does not go beyond this goal. In tone, it is more thoughtful than inspiring. (2010)

Features the views of Robert Redford and a variety of stakeholders.

Watch the entire video (56 minutes) or 17-minute clips at:

<http://www.kued.org/productions/wilderness/watch.php>

## 

## 

# Practice 1: Get the Truth

## Exercises

### Science Literacy Quiz (see Appendix 1 for answers)

Required time: 15 minutes. Post the answers, or review in class (additional time required.)

See the Appendices (below) for the answers.

*Learning goals:*

To assess the class level of general knowledge on science and energy.

To teach these basic facts.

To improve one’s ability to read popular science.

**Science Literacy Quiz 2018**

1. The average global temperature on Earth has increased by 0.8°Celsius since 1880. How much is this increase when stated in Fahrenheit?

2. Define "hydrofracking.”

3. Define "peak oil."

4. What is "An Inconvenient Truth" and what is the inconvenient truth it refers to?

5. Carbon dioxide is often measured in “ppm”. What does “ppm” stand for and why is it important in climate change science?

1. In 2018 US proven crude oil reserves were estimated to be 43,800,000,000 barrels. <https://www.eia.gov/naturalgas/crudeoilreserves/> At rates of US usage, and assuming no oil is imported, how long would this oil last our country?

7. How many barrels of oil are used daily in the world? How long will it last?

8. What is ethanol and how is it used?

9. Draw a map of the world that includes the equator and the continents of the world. Use arrows to indicate which parts of the world (if any) are warming the fastest.

10. Draw a map of the North Pole and the seas and countries that surround it.

# Practice 2: State of the Planet

## Exercises

### State of the Planet Quiz (see Appendix 2 for answers)

1. A \_\_\_ degree drop in global temperature buried a large part of North America under a towering mass of ice 20,000 years ago.
2. 5
3. 20
4. 90
5. 10
6. Human-emitted greenhouse gases trap extra heat in the atmosphere. Some of this warms the Earth’s surface, but how much goes into the oceans?
7. 50%
8. 10%
9. 90%
10. 30%
11. If fossil-fuel burning continues at a business-as-usual rate, such that humanity exhausts the reserves over the next few centuries, the atmosphere would then not return to pre-industrial levels of CO2 even \_\_\_\_\_\_ of years into the future.
12. Tens of thousands
13. Thousands
14. Hundreds
15. Dozens
16. Researchers found that the low snowpack of April 2015 was “unprecedented in the context of the past \_\_\_ years.”
17. 100
18. 500
19. 50
20. 250
21. At current rates, [the ocean] will be more comprised of acid than at any time in the past \_\_\_ years.
22. 20,000,000
23. 6,000,000,000,000
24. 5000
25. 100
26. Extinction scenarios suggest that if species cannot move, and warming is held to a minimum, by 2050 22–31% will be “committed to extinction.” If warming is at a maximum, in 2050, what percent of species would disappear?
27. 53% to 62%
28. More than 62%, but the number is inestimable
29. None of the
30. Above 38–52%

7. The climate is changing at a pace that's far faster than anything seen in \_\_\_\_ years.

1. 65,000 years
2. 65,000,000 years
3. 6,500 years
4. 650 years

## Media

### Leaders in Science: Peter D. Ward, Paleoclimatologist

*Length:* 47 minutes.

[Peter Ward, Paleoclimatologist](http://uwtv.org/series/faculty-lectures/watch/HP_Fvs48hb4/). (2013). Who is afraid of the big bad climate? What is the worst that global warming can do? University Lecture Series, University of Washington. <http://uwtv.org/series/faculty-lectures/watch/HP_Fvs48hb4/>

*Key segments:*

6:00-26:00 What caused the mass extinctions?

32:00-38:00 CO2 in the atmosphere over time; Impacts of climate change on Gross National Product

*Discuss:*

What is the role of scientists as leaders for fighting global warming? At the end of the film, Ward talks about the need for scientists to reach out to the public. How effective have they been in doing that? What might they do better?

*Learning goals:*

Identify causes of extinctions and climate in deep time.

Interpret current data about increasing carbon dioxide concentrations in the atmosphere.

Explore the role of scientists as leaders on global warming.

### Leaders in Politics: Al Gore.

*Length:* 1 hour 15 minutes

*Instructions:*

An Inconvenient Truth (2006). Gore shared the Nobel Peace prize (for this film and related work) with the Intergovernmental Panel on Climate Change. It is now an historic contribution, and the scientific predictions in the film have all been upheld. Check out this site for an animated update on Arctic summer ice melt: [**https://earthobservatory.nasa.gov/Features/WorldOfChange/sea\_ice.php**](https://earthobservatory.nasa.gov/Features/WorldOfChange/sea_ice.php)

Check out this one for an updated animation of temperature changes across the world:

[**https://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php**](https://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php)

*Discussion:*

What is the role of politicians as leaders on global warming? How does their role constrain their contribution? How does their role enhance their contribution?

Consider the personal style of this presentation, perhaps in contrast with that of Peter Ward (above). How important is style to environmental leadership?

*Learning goals:*

Be conversant with Gore’s contribution to raising public awareness of global warming.

Understand the leadership contributions of politicians in contrast with that of scientists.

Appraise the style of leaders for sustainability. What works with what audiences? What does not work?

# Practice 2: Assess the Risks

## Exercises

### Assessing Drought in the San Joaquin Valley: An In-Class Exploration of Stakeholder Risk

*Length:* 45-90 minutes. The amount of time devoted to this exercise depends on whether the class investigates both the actual risks to particular stakeholders and how to write an effective white paper complete with finding credible resources.

*Instructions:*

The Problem

You are a prominent almond grower in the San Joaquin Valley, which has been significantly affected by drought. After months of trying to reach the president of the United States on this issue, he/she has just invited you to meet to discuss how drought is affecting business in the San Joaquin Valley. There's only one catch: the President can only fit you into his/her schedule exactly \_\_\_ minutes from now.

Find some more context here:

[**http://www.csmonitor.com/USA/Politics/2014/0214/Obama-in-California-a-pledge-of-drought-aid-climate-change-planning**](http://www.csmonitor.com/USA/Politics/2014/0214/Obama-in-California-a-pledge-of-drought-aid-climate-change-planning)

[**https://www.drought.gov/drought/states/california**](https://www.drought.gov/drought/states/california)

Outline your presentation to the president based on the following criteria:

The Analysis. A position paper should:

State the problem

Identify key stakeholders and how they wield power

Assess the risks to key stakeholders using peer reviewed science

Present reasonable solutions (based on your scientific and stakeholder analyses) and argue for one preferred solution

Identify any ethical issues that must be addressed during intervention

*The style of the paper. Use APA style for the reference list:*

Author, F.M. (Publication year). Article Title. *Journal Title*, *Volume* (Issue), pp.-pp. doi:XX.XXXXX [or] Retrieved from journal plus the URL

*Learning Goals:*

Assess the risks to key stakeholders.

Discover and correctly present credible references including:

Peer reviewed science; Published position papers; Laws, existing and proposed

Use the library website and data bases to improve on Google, and find peer-reviewed articles.

Learn to organize a position paper (e.g. a “white paper”) on a climate change-related issue.

### Looking Back in a Hundred Years

*Length*: 45-60 minutes depending on how the writing/reminiscing is done (inside of class, as homework, individually or in groups.)

*Instructions:*

It is the year 2125, and you are looking back on how the world has changed in the last 100 years. Reminisce in writing (individually or in groups) about the natural and social history of the world and the legacy of that bygone era.

*Discussion Part A:*

If optimism is about assessing realities on the ground, and hope is about trusting yourself and your fellow human beings to protect the planet, would you say you are optimistic? Hopeful?

Read Alex Steffen (2016, March). A Talk Given at a Conservation Meeting One Hundred Years from Now. *The Solutions Journal* 7 (1), 11-13. You can find it here:

<https://www.thesolutionsjournal.com/article/a-talk-given-at-a-conservation-meeting-one-hundred-years-from-now/>

*Discussion Part B:*

What surprises you about Steffan’s piece?

Is Steffan optimistic? Hopeful?

Is he convincing?

## Media

### What we KNOW about Climate Change: Atmospheric Scientist Kerry Emanuel

MIT Energy and Clean Tech Series (90 minutes), plus questions.

*Lecture at:* [MIT site 1-30-2018](https://www.youtube.com/watch?v=7so8GRCWA1k&t=2656s).

*Key clips:*

42:00-48:00 “Known” risks

48:00-53:00 Consequences

53:00-57:00 Realistic solutions

57:00-59:00 Summary and end.

Emanuel describes known risks, with warming as a proxy for all climate events, and points out that the risks present not a binary problem, but rather a probability curve. What are the most likely consequences of warming from a climate point of view?

What are important societal consequences (US military predictions)?

Discuss what Emanuel believes to be realistic solutions (carbon sequestration, nuclear power).

### Climate Change: The Facts (2020)

*Length:* About 55:00 minutes.

*From the PBS Website:* “Researchers from around the world provide global context to the crisis in ‘[Climate Change - The Facts](https://www.pbs.org/show/climate-change-facts/).’ Featured experts include Dr. James Hansen, former Director of NASA Goddard Institute for Science Studies; Professor Naomi Oreskes, Science Historian at Harvard University; Professor Michael Mann, Climate Scientist at Penn State University; Richard Black, Director of the UK Energy & Climate Intelligence Unit; Professor Andrew Shepherd, Climate Scientist at The University of Leeds, Sunita Narain, Director General of India’s Centre for Science and Environment; and Greta Thunberg, Swedish teenage climate advocate and Nobel Peace Prize nominee.”

# Practice 3: Weigh the Stakes

## Exercises

### Hunt for Oil

*Length:* 30-45 minutes

*Instructions:*

How much oil do we have on the planet? How much do we use? Assessment of oil supply typically depends on whom you ask. In this exploration, the class will look for currently recoverable reserves of oil on the planet. To be “currently recoverable,” oil must be said to exist in a particular place, and it must be both technically and economically recoverable.

Working in pairs, scour the internet for opinions about how much oil is left on the planet. Then, using current statistics on world oil usage available at the EIA (Energy Information Administration of the US government), calculate how long that oil will last the world.

Share your calculations and sources with the class (as on a white board or electronic document) and describe your results.

*Discussion:*

The class compares their results and evaluates both the sources and the probable quality of their information. Introduce anecdotal information on oil availability in the future if you find any.

What are the current consequences of oil depletion? What ae the likely future consequences?

*Learning Objectives:*

Identify sources that provide information on fossil fuels.

Assess the credibility of those sources.

### The Tragedy of the Commons Meets Uber

*Length:* 30-45 minutes.

*Instructions:*

In the tragedy of the commons, societal collapse occurs when community members freely graze their animals on land they hold in common, causing their growing herds to eventually deplete that land.

*Discuss in small groups and report out to the class:*

1. In general, how does a society prevent the tragedy of the commons?
2. How does preventing the tragedy of the commons depend on human nature?
3. Today the globe is our commons, and it is being overrun by humans and their domestic animals, crops and pollution. The atmosphere itself is a commons into which we are dumping pollutants like CO2. What is not so clear is how people will organize globally to regulate the use of the atmospheric commons. Regulation is needed, yes, but what kind of regulation, created by whom? What will be the resistance to that regulation, and how will it be overcome?
4. Discuss Uber versus public transportation as an example. (Uber has been criticized for adding many vehicles to the roads while undermining public transportation and failing to provide its drivers with a decent income.)

*Learning Objectives:*

Describe and analyze the tragedy of the commons.

Recommend systemic interventions to prevent the tragedy of the commons.

Apply systemic interventions to curb global pollution.

### The Stag Hunt Dilemma (see Appendix 3 for teaching note)

**The Stag Hunt Dilemma**

*The Dilemma: Version 1*

A group of hunters tracks a large stag and learns that it often takes a certain path. If they work together, the hunters can hide near the path and kill the stag, and everyone will eat. However, if the hunters spook the stag or fail to cooperate in the kill, their quarry will escape and everyone will go hungry. The hunters wait on the path for hours, which turn into a full day. Finally, they all see a large hare coming down the path. Each hunter knows that if he kills the hare, he can eat, but the trap laid for the stag will be sprung and the others will go hungry. On the other hand, if he does not kill the hare someone else might. The stag might never come, but the hare is there right now. What should the hunter do?

*Discussion*:

To "risk" is to expose someone or something to danger, harm, or loss. Discuss the stag hunt dilemma in terms of risk, naming who and what are at risk, and the magnitude of their risks.

*The Dilemma: Version 2*

Several tribes each send their best hunter to join the group that stalks the stag. Thus, when the hare comes down the path, each hungry hunter knows his tribe will protect him from being punished for killing it. What should the hunter do?

*Discussion:*

How have the risks and outcomes changed?

**TEACHING NOTE:** (See Appendix 3)

**References**

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## Media

### Climate Change Denial Enforced at the Florida EPA

FLORIDA DENIAL OF TERM CLIMATE CHANGE

<https://www.youtube.com/watch?v=WASFEciCmp4&ebc=ANyPxKrP9rNnGal4JVW-g1GIP7Z4wpJAPiV-7eAK0gYhpEYUt2T1s5wCM762C3uNVb0Efypm77HPx4F3iD8qWaoIsBRGr3v71A>

FLORIDA OFFICIAL WON’T USE “CLIMATE CHANGE,” INTERVIEW OF BART BIBLER TOLD TO GET PSYCHIATRIC REVIEW

### Tipping Point: The End of Oil (2011) 91 minutes

<http://www.cultureunplugged.com/documentary/watch-online/play/12226/TIPPING-POINT--THE-END-OF-OIL>

**Synopsis:** In an oil-scarce world, we know there are sacrifices to be made in the pursuit of energy. What no one expected was that a tiny Native community living down the river from Canada's tar sands would reach out to the world for help, and be heard.

### Gasland I (2010) 107 minutes

The first of director Josh Fox’s influential trilogy on gas extraction and impacts. Explores the effects of fracking on local water supplies and communities nationwide.

### Gasland II (2013) 125 minutes

Continuation of Gasland I. Worth viewing in its entirety, or only view some of the more interesting follow-ups to Gasland I. Delves deeper into the political issues.

# Practice 4: Define the Business of Business

## Exercises

### The Hagens “Climate Change To Do” List for Young Urbanites

View the Converging Economic and Environmental Crisis" 10 July 2014

[**https://www.youtube.com/watch?v=\_hNi-7EjsH4**](https://www.youtube.com/watch?v=_hNi-7EjsH4)

Discuss how the economic and environmental issues Professor Hagens raises will emerge in an urban and youthful lifestyle. Here’s his list of recommendations:

Embrace life

Assert control

Think/act in terms of capital

Take back language

Learn something new, something old

Give something up

Know they reptile

Buy solar

Personally divest (Appreciate a car ride.)

Choose your tribe (Who’s on the dining car with you?)

Be prosocial (not a hermit)

Like yourself (when on your deathbed…)

In the battle between business and ecology, know which side you are on…

## Media

### Business Leader: Ray Anderson, Interface

*Length:* 15:45 minutes

The Business Logic of Sustainability. <https://www.ted.com/talks/ray_anderson_on_the_business_logic_of_sustainability>

A classic. This video is also listed in the optional Leadership Workshop described in the section below on course culture.

### Business Leader: Jonathan Wise, The Comms Lab

*Length:* 42:02 minutes

In the podcast *Advertising* at [www.sustainababble.fish](http://www.sustainababble.fish) (December 2, 2019, No. 159), hosts Ol and Dave examine the question, “But what’s it actually like selling stuff you know is bad news? Can the ad industry – increasingly staffed by the eco-anxious, after all – use its dark arts to save the planet?” Wise is co-founder of [The Comms Lab](https://www.thecommslab.com/).

# Practice 5: Engage Global Leadership

## Exercises

### Identify Climate and Energy Leaders

*Learning goals:*

To identify and classify current leaders in climate and energy

To compare and contrast leaders’ skills and influence

*Length:* Open. Can be done in class or as homework.

*Instructions:*

Identify leaders you have encountered during this course. For each leader, list their constituency (who do they actually lead?), describe their personal style, and identify the skills that they have (in the areas of scientific and media literacy, risk analysis, stakeholder understanding, internal change, and world impact.) Finally, assess how much power and influence each has (on a scale of low-medium-high) and defend your choice.

Use this form or any other format.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Leader | Constituency | Personal Style | Skills | Power and Influence |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

*Discussion:*

Who makes this list easily? Who seems less important? Why this difference?

Among these leaders, who are thinking about the planet as a whole?

Which of these leaders have a plan to prevent global warming?

### Debate: Who should define the “social” in “social enterprise”?

This debate raises awareness of key institutions for global change and, in particular, helps students clarify their values about the role of government and business in a capitalist democracy.

For more information and instructions please see André, R. (2016, June). Who should define the “social” in “social enterprise”: Elected governments or partnered corporations? *Management Teaching Review* 1(3).

## Media

### The Age of Consequences 2016 80 minutes

Through the lens of national security and global stability, a look at the impacts of climate change on increased resource scarcity and migration. As part of a case-study analysis, admirals, generals and military veterans take viewers beyond the headlines of the conflict in Syria, the social unrest of the Arab Spring, the rise of groups like ISIS, and the European refugee crisis -- and lay bare how climate change stressors interact with societal tensions, sparking conflict. (Quoted description.)

### Science and Policy: Sir Robert Watson, IPCC Spokesperson

##### [Union frontiers of geophysics lecture](https://www.youtube.com/watch?v=Yaf0DGVAJAg). (54 minutes) (2012)

Watson is a renowned scientist who as a leader is both data-driven and impassioned. This video makes IPCC results come alive. Evaluating Watson’s leadership style is a useful exercise.

# Conclusion: The Plan

## Exercises

### **Exploring En-Roads**

[En-Roads](https://en-roads.climateinteractive.org/scenario.html?p53=0.1&v=2.7.29) is an online tool that allows you to select one or more climate interventions and see their cumulative effect on global temperature over time. Created and supported by MIT and Climate Interactive, it is comprehensive and scientifically based, and as of 11/2020 the science is updated monthly.

Simple to use, and ideal for small group discussions.

Exercise and Discussion: This tool focuses on goals, not the human decision making and leadership that are needed to achieve them. After choosing their preferred interventions (their goals), groups should identify which interventions are realistically achievable *given human nature* (the implications for leadership.)

### Dialogue: What’s next for me?

To frame this discussion, use the dialogue technique described elsewhere in this Handbook in the article entitled “Use the Dialogue Technique to Deepen Participation.”

## Media

### [Bill Gates' Five Point Plan: Blog Post with Video (2018) 5 minutes](https://www.gatesnotes.com/Energy/My-plan-for-fighting-climate-change?WT.mc_id=10_17_2018_06_EnergyClimateChangePlan_BG-EM_&WT.tsrc=BGEM)

“To prevent the worst effects of climate change, we need to get to zero net greenhouse gas emissions in every sector of the economy within 50 years—and as [the IPCC recently found](http://www.ipcc.ch/report/sr15/), we need to be on a path to doing it in the next 10 years. That means dealing with electricity, and the other 75% too.

**Electricity** (25%). Although there’s been progress in the renewable energy market, we still need more breakthroughs. For example, wind and solar need zero-carbon backup sources for windless days, long periods of cloudy weather, and nighttime. We also need to make the electric grid a lot more efficient so clean energy can be delivered where it’s needed, when it’s needed.

**Agriculture** (24%). Cattle are a huge source of methane; in fact, if they were a country, they would be the third-largest emitter of greenhouse gases! In addition, deforestation—clearing land for crops, for instance—removes trees that pull CO2 out of the air, and when the trees are burned, they release all their carbon back into the atmosphere.

**Manufacturing** (21%). Look at the plastic, steel, and cement around you. All of it contributed to climate change. Making cement and steel requires lots of energy from fossil fuels, and it involves chemical reactions that release carbon as a byproduct. So even if we could make all the stuff we need with zero-carbon energy, we’d still need to deal with the byproducts.

**Transportation** (14%). Low-emission cars are great, but cars account for a little less than half of transportation-related emissions today—and that share will shrink in the future. More emissions come from airplanes, cargo ships, and trucks. Right now we don’t have practical zero-carbon options for any of these.

**Buildings** (6%). Do you live or work in a place with air conditioning? The refrigerant inside your AC unit is a greenhouse gas. In addition, it takes a lot of energy to run air conditioners, heaters, lights, and other appliances. Things like more-efficient windows and insulation would help. This area will be more important over the next few decades as the global population moves to cities. The world’s building stock will double in area by 2060. That’s like adding another New York City every month for 40 years.

(The final 10% is a sixth, miscellaneous category that includes things like the energy it takes to extract oil and gas.)”

### Al Gore (2016). [The case for optimism on climate change.](https://www.ted.com/talks/al_gore_the_case_for_optimism_on_climate_change)

(25 minutes). TED2016.Transcript available on the TED website.

### Nate Hagens (2016). [A guide to being human in the 21st century](https://www.youtube.com/watch?v=-EMlDuNH59c).

(117 minutes) Earth Week Speakers Series at the University of Wisconsin, Stevens Point.

### **How to Let Go of the World and Love all the Things Climate Cannot Change (2016)**.

Video: 127 minutes

The third in the Josh Fox trilogy that began with *Gasland*, this film defaults to local change.

“After admitting, about 40 minutes in, that he is resigned to pure hopelessness, Fox suddenly shifts tactics, seeking out ground-level activists around the world who have come up with local solutions to climate problems. “I needed to find the people who’d found this place, this place of despair, and gotten back up,” he narrates. How these solutions might be implemented, and on what scale, are questions the movie, despite a rambling two-hour-plus running time, never quite addresses.”

--Ben Kenisberg. Sundance Film Review: ‘How to Let Go of the World and Love All the Things Climate Can’t Change.’ *Variety*. January 24, 2016.

# Course Culture

## Leadership Workshop: Personality and Style.

When students come in with a wide range of knowledge about leadership, this workshop develops common knowledge and vocabulary based on the Big Five personality research. Students take the IPIP-NEO here: <https://www.personal.psu.edu/~j5j/IPIP/> and receive a long printout on their personality.

The lecture outlined below includes videos of Ray Anderson on the case for business and planetary sustainability, and an excellent Susan Cain Ted Talk on introversion.

**Leadership Workshop Part 1**

Your Personality and Style

1. What is your personality?
   * Personality is the unique pattern of enduring thoughts, feelings and actions that characterize an individual.
   * The expression of the sum total of who you are biologically, psychologically and behaviorally.
   * When you know who you are, you can figure out where you best fit in.
   * Where does personality originate?
2. How do psychologists determine an individual’s personality?
   * Personality tests measure personality traits
   * Need to be honest in answering questions
   * Example: Internal-External Locus of Control
   * How can you know whether a psychological test is a good one?
   * Validity – when a test measures what it says it measures
   * Reliability– when a test, when repeated, will give similar results
   * Check if research of the test has been published in scholarly journals
3. How is the study of personality traits applied in organizations ?
   * Personality *Profile*: a test that describes an individual’s *whole* personality, rather than just the separate traits (such as locus of control) that make up that personality
4. The Big Five profile clusters different personality traits into enduring dimensions of personality that together describe the whole person.
5. It’s universal! Valid worldwide.
6. The Big Five personality factors

* Extraversion and energy (sometimes referred to as “sociability,” or “surgency”) versus introversion and passivity
* Adventurous versus traditional (also referred to as “openness versus closedness”)
* Agreeableness versus tough-mindedness
* Conscientiousness versus undirectedness
* Emotionality (also called neuroticism) versus stability

1. How is the study of personality traits applied in organizations?

Using the Big Five:

* Conscientiousness predicts motivation to perform well in a job
* Personality is not related to cognitive ability
* Agreeableness and conscientiousness predict getting along
* Extraversion and openness predict getting ahead
* The Big Five is applicable cross-culturally
* What other behaviors does the Big Five profile predict?

1. How does the Myers-Briggs Type Indicator (MBTI) assess personality?

* Four categories:
  + introversion versus extraversion
  + sensing versus intuition
  + thinking versus feeling
  + judging versus perceiving
* Measures individual personalities along these four continuums to create sixteen (four x four) personality types
* Categories 3 and 4 are hard to interpret
* What do the Big Five and the MBTI have in common?
* What can we do with these in business?   
  2x2x2x2=16 types (a little confusing)
* Bureaucrats, Enterprisers and Independents
* A ‘natural’ bureaucrat
* A ‘Natural’ Independent
* A ‘Natural’ Enterpriser…

1. What is your emotional style and its importance in organizational life?

* Emotion: a momentary, elementary feeling of pleasure or displeasure, and of activation or deactivation
* Mood: an ongoing cycle of feelings that are not intense enough to interrupt your ongoing thought processes
* Emotional style: the way you express your emotions; closely related to your personality
* What suggests an individual is emotionally competent on the job?
* Emotional competence, also referred to as “emotional intelligence” and “EQ”, is a multi-faceted personal characteristic (not one trait) that includes:
  + self-awareness
  + psychological self-management
  + social awareness and empathy
  + relationship management
* Emotional competence predicts:
* Success in job interviews
* Positive work attitudes
* Altruism on the job
* Successful task performance

**Leadership Workshop Part 2**

1. The Challenge of Leadership
2. What is leadership, really?

* A practical definition of leadership
  + The ability of individuals to influence, motivate, and enable others to contribute to the effectiveness and success of their organizations

1. **Formal leaders** have formal or legal authority to direct others in their organizations
2. **Emergent leaders** exert significant influence over others despite having no formally allocated authority
3. Streams of leadership research

* Leaders are studied because they are powerful and they are role models
* Major streams of research:
  + **Contingency Theory**: Those studies that focus primarily on individual leaders
  + **Practice Theory**: Those studies that focus on leadership as a dynamic, interactive influence process among individuals
  + **Systemic Theory**: Those studies that focus on leadership practices at the level of societal systems

1. Why are some people leaders while others are followers?
2. Traits that predict or derail leadership
3. Introverted Leaders
4. [Susan Cain Ted Talk on Introversion](https://www.youtube.com/watch?v=c0KYU2j0TM4)

* Warren Buffett
* Steve Jobs
* Barack Obama

1. The choice to lead

* Do you have the traits typically associated with leadership?
* What are your goals in your career and in life?
* Is your organization ready for climate leadership?

1. Can you learn to be a leader?
2. What is your leadership style?
3. Most leadership behaviors can be categorized on two dimensions

* **Consideration** is the degree to which a leader shows concern and respect for followers, looks out for their welfare, and expresses appreciation and support for them
* **Structure** is the degree to which a leader defines and organizes his or her role and the roles of followers, is oriented toward goal attainment, and establishes clearly-defined patterns and channels of communication
* Goal is to score highly on each dimension

1. Do you have the potential to be a transformational leader?

* **Transactional leaders** are those who manage their followers, contingently reinforcing them based on whether they meet organizational goals
* **Transformational leaders** motivate their followers to move beyond their personal self-interest for the good of the group or organization
* Are not necessarily charismatic

1. Do you have the potential to be a charismatic leader?

* Charismatic leaders are leaders that exert an unusual amount of influence on their followers, generally because of some combination of their persona, their goals, and some serendipitous extraordinary circumstances

Major characteristics:

* Self-confidence
* Vision
* Unconventional behavior
* Environmental sensitivity
* Sensitivity to followers
* Role modeling

1. Ray Anderson, founder and CEO of Interface, considered by many to be the father of the business sustainability movement
2. [Ted Talk](http://www.ted.com/talks/ray_anderson_on_the_business_logic_of_sustainability?language=en) by Ray Anderson
3. Will you get a chance to lead?
4. For climate leaders…as for all leaders…

* Personality matters
* But motivation to lead matters more
* What a company thinks it needs will influence your opportunities and your success
* Leadership prototype: sensitivity/compassion, intelligence, dedication, and dynamism/energy
* Climate leadership prototype?: all the above, plus knowledge and commitment

## Use the Dialogue Technique to Deepen Participation

A dialogue is an authentic, personal engagement in the class that leads to unique interactions and understandings. It’s NOT a discussion, exactly, although participants will talk together…Imagine throwing your ideas into the center of the ring and letting them develop there…

Running a dialogue is a good way to judge both the tenor and the interests of the class.

Guidelines for a dialogue are:

* Listen and speak without judgment
* Speak only for yourself, truthfully
* Acknowledge each speaker (verbally and nonverbally)
* Respect differences (suspend your own certainties)
* Suspend role and status importance
* Avoid crosstalk (minimize two person conversations)
* Focus on learning (leave with new perspectives)
* Seek the next level of understanding (examine hidden assumptions, guide the dialogue to deeper levels)
* Release your need for specific outcomes
* Balance speaking and listening, inquiry and advocacy

See Berkovich, I. (2014). Between person and person: Dialogical pedagogy in authentic leadership development. Academy of Management Learning and Education 12 (2), 245-264.

## The Role of Humor

Discuss John Oliver’s take on climate change at “Climate change debate: Last week tonight with John Oliver.” May 11, 2014.

Some viewers may find some language offensive (discuss).

Does humor help us learn? What are its strengths and weaknesses as a leadership tool?

Experience current British climate humor at sustainababble.fish. Compare with American humor?

# Term Projects

## White Paper Assignment

**Overview:**

A “white paper” is a recommendation to a client to take a particular action (or set of actions) based on current science and policy. For example, it might be a recommendation to a large company on whether they should purchase a large tract of land to develop a subdivision in Phoenix, given the prospects for drought in that region. Or, you might study how a prolonged drought (a development in the natural environment) might influence the location of a drug company that requires a lot of water for production, and how local, state and federal governments along with industry and community associations are influencing drought policy that affects that company’s access to water.

Typically, a white paper is written to help drive a policy decision by a business or a government entity. Thus, the purpose of this paper is to give you the opportunity to help direct a typical, major business or community decision *of your choice*. Find a decision that is real, current, and important to you. Choose an issue that challenges both the natural environment and a key stakeholder, and that is also influenced by other stakeholders. See more sample topics below.

In your paper…

1. Describe your client’s goal: Identify the problem and the particular client to whom you will be making a recommendation (such as a company, trade association, or community).
2. Present original, peer reviewed science that can help these stakeholders understand the issue. Weigh the evidence critically. For your most important points, show how the science has converged on the “truth.” Search for disconfirming evidence, if any, and report what you find or, if after a reasonable search, none is found, report where you looked and that you found nothing: For example, you might write something like “I searched x data bases using key words x y z and examined x articles but found no disconfirming evidence.” When using media reports of science, read the original sources, too.
3. List the key stakeholders involved with the issue, and describe their goals and their power. Find such information in peer-reviewed articles, published position papers (such as local, state and federal government reports, industry position papers), reputable media accounts and the like. Who is influencing policy and why? What are the implications of the influence of these stakeholders for your own stakeholder?
4. Make a recommendation to your target stakeholder about how to manage the issue to their benefit. Consider assigning probabilities to your recommendation, perhaps by developing a set of scenarios of which your recommendation is one. Discuss the limitations of your research. What aspect of your research might require more development, if you had more time and resources?

For more ideas on how to write an “A” paper, see the grading criteria below. See also the sample paper in BB under Course Documents, Miscellaneous.

**More Sample Topics**

In general, assess any of the risks of climate change (or energy depletion) for your company (and/or industry, and/or community) and recommend how key stakeholders (company, town, city, state, federal government, others you can think of) are and should respond (include, for example, what support does the government offer?) For example, you might study:

--how sea level rise (or water availability, or extreme weather, or surface warming, etc.) is a factor in a business relocation decision in a particular city and state. GE, for instance, recently moved its headquarters to the Boston seaport district, and is raising its building lot by five feet in order to minimize future damage from ocean surges as sea level rises.

--whether a company should build a subdivision (or make any other investment decision) in a particular state and city given predictions about future drought (hurricanes, fires, fracking, or whatever).

--assess whether installing solar panels is likely to be advantageous to your company given city, state and/or federal support (or, assess whether solar ground mount arrays would be good for your community given such support)

--Your company wants to be the greenest of the green when it comes to its overall energy use (or, its supply chain, or its buildings, or its manufacturing process). Advise it what energy source to adopt to mitigate global warming, analyzing both the science of EROI (energy return on energy invested) and relevant stakeholder policies.

Topics that would *not* meet these criteria would be, for example, a review of the extent to which solar (gas, nuclear) energy has been adopted in the U.S. (does not pose a problem to solve), or whether putting solar panels on your house would be good for your family (important, but not macro enough for our course—but you could study whether your whole town might adopt solar).

**Three Stages of the Paper Development**

To help you write your best possible final paper, your instructor will help you during the process:

1. White Paper Topic submitted to your instructor for approval and development.  Submit the title of your paper and a 150-250-word abstract describing how you hope to achieve the goals for this paper.
2. White Paper Design submitted to instructor for their recommendations.  Include: Title, abstract, 3 or more section heads with one paragraph describing the goals for each section, the proposed Bibliography (or at least most of it). You can change this design later based on any feedback you receive, or other developments that may occur.
3. Final White Paper submitted. Hard copy is due in class (at the beginning of class on the due date), and the paper must be uploaded to Turnitin by midnight on the day it is due in class.

**Paper Checklist and Specifications**

Check the university guidelines for plagiarism and be sure you understand them.

All sources within your text must be documented. Sources must be cited even if the information you use is paraphrased, and all directly quoted material must be indicated with quotation marks and cited. The entire paper must be your own original work.

Word count between 2500 and 3500 words. The word count includes text, tables, and references, e.g. anything you created, including appendices. Illustrations that you did not create can be useful to your argument, but do not count in the word count.

Text format: Times New Roman, 12 point, 1.5 spaces per line, not right-left justified

Title page with your name, date, class name and number, the title of your paper, and the number of words.

Bibliography of 12 or more references, including at least 6 from peer-reviewed articles

Bibliography in APA format. Your bibliography should include only sources cited in the text, and all the sources in the text should have a bibliographic reference. Go here to get software to help you format: <http://subjectguides.lib.neu.edu/Citations>. The Web has many useful APA formatting sites. Here’s one that’s good: [http://owl.english.purdue.edu/owl/section/2/10/](https://owl.english.purdue.edu/owl/section/2/10/)

Text citations in APA format. Some students like [http://citationmachine.net/](http://www.citationmachine.net/) to help them achieve the proper format.

Articles from websites must include a full citation, which includes the author and sponsoring organization, if any, and the date. (Do not include just the web address and assume your reader will look up the author, title, date, and publication. Reference lists are designed to help out your reader, who wants to know where your information comes from.)

Use proper formatting/spelling—these count. Spell check.

Hand your paper in on time. Late papers will incur grade reductions of one grade per day (such as B to B-).

Upload your paper to Turnitin on Blackboard by the end of the day on the due date.

**How will this paper be graded?**

After establishing the client and the problem the client wants to address, first examine the relevant science. Then, based on this science, along with your review of what concerned stakeholders have already done to address the problem, make a recommendation for action. An “A” paper:

1. Meets the Specifications.
2. Examines the science effectively.

Use original sources. A good recommendation is based on original sources rather than secondary sources. For instance, if CNBC tells us something, why believe it? Don’t rely on popular press sources; go to the originator of the data and the original study or paper, read it, report on it, and cite it. It is better to present a narrow paper that is true than a broader paper that only might be true.

Use a variety of sources. A well-argued case weighs and integrates facts from a variety of sources, rather than relying on one or two sources or relying on similar sources. For example, data from only one scientist, or one institution, are not sufficient when making important points. Data from several, and preferably different types of institutions (businesses, trade groups, government, academic scientists, independent scientists, etc.), are more likely to reflect reality. You will need at least a dozen sources to make an effective argument.

Triangulate. For important points, triangulate on the facts. That is, show more than one source that documents the point.

1. Weighs stakeholder power and points of view. Present two or more different viewpoints on the problem by engaged stakeholders. Show that you have taken into account these alternatives.
2. Finalizes your argument, and makes your recommendation.

A well-argued paper has sections that are clearly labeled, and which advance your argument. For a paper of the assigned length, using an introduction and three or more sections is a good goal. Within these sections each paragraph should have a particular purpose that is described in its topic sentence.

Make a recommendation that draws on the science and also the influence of stakeholders other than your target stakeholder. Your recommendation should flow logically from your analysis of the science and the stakeholders.

## Sample White Paper

“Should the government of the State of Baden-Württemberg ban diesel cars from driving through Stuttgart, Germany?”

Tim Lienemann

12/01/2017

Word count (excluding references): 2,729

Word count (including references): 3,178

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**Abstract**

This paper for the *Developing Leaders for Global Sustainability* class at Northeastern University deals with the debate on whether the city of Stuttgart, Germany, should ban old diesel cars that do not meet certain standards to improve the air quality and, thereby, the health of local residents or whether they should continue allowing diesel cars to drive through the city which would lead to less carbon dioxide emissions and, therefore, have positive effects on the climate in a long-term.

To come to a final recommendation this paper analyzes the various stakeholders’ interests and the scientific arguments and evidence that points to the threats of air pollution to health and life of Stuttgart residents, but also the implications diesel cars’ emissions have for the climate.

Finally, the paper recommends the government of the State of Baden-Württemberg to enact a permanent ban on diesel cars that do not meet emission standards, while improving public transport and e-car sharing services to also meet the responsibility for the global climate.

**Problem**

On July 28th, 2017, the administrative court of the city of Stuttgart, Germany, ruled that the state government has to implement measures that would increase the quality of the air, also by banning certain diesel cars that do not meet emission standards from driving through the city. The ruling comes after the “Deutsche Umwelthilfe” (English: The German Environmental Aid Association) or short “DUH” filed an action arguing that the statutory limit of nitrogen dioxide emissions had been exceeded by up to 100 percent for many years and that only a ban on certain vehicles could provide a solution. The pollution of the air with nitrogen dioxide and particulate matter (PM), they argued, causes a threat to the health and life of the city’s residents. The court ruled in their favor, stating that necessary protection of the health and life of Stuttgart residents takes precedence over protecting the legal interests of individuals and their property, namely the declining value of diesel cars owned by people in the Stuttgart area and that this objective could not be achieved by the voluntary upgrades to diesel cars made by the automobile industry, a solution proposed by the state government (Gericht ebnet Weg, 2017). The government of the State of Baden-Württemberg, which currently is formed by a coalition of the center-left Alliance 90/The Greens, often simply “Greens” (German: Bündnis 90/Die Grünen or “Grüne”) and the liberal-conservative Christian Democratic Union of Germany or short CDU (German: Christlich Demokratische Union Deutschlands) and is headed by the Minister President of the state of Baden-Württemberg Winfried Kretschmann, appealed the court ruling and took the case to the Federal Administrative Court (German: Bundesverwaltungsgericht) in October (Baden-Württemberg geht, 2017).

The problem, many argue, with banning diesel cars and setting a precedent for regulations like that is that they are a key component in Germany’s plan to reach 2020 World Climate Goals. Cars that run on diesel fuel burn less, than cars that run on regular gasoline, which makes them more environmental friendly. In an interview with the German newspaper *Kölnische Rundschau* Prof. Dr. Stefan Bratzel of the University of Applied Science Bergisch-Gladbach said he believes that: “A further decline in the percentage of newly registered diesel fueled cars would make the realization of the 2020 World Climate Goals practically impossible” (Höning & Marschall, 2017). In his opinion piece titeled “Rettet den Diesel!” (English: Save the diesel!”), published in the German newspaper *BILD am Sonntag*, Minister President Armin Laschet of North Rhine-Westphalia, Germany’s biggest state, argues that millions have trusted the promises of politicians to support diesel cars and they now have to follow through on them, and that the new generation of diesel engines is the most environmentally friendly fuel-burning engine there is (Laschet, 2017). Therefore, the dilemma local and federal politicians find themselves in is that they have to decide whether to pursue a policy that would be good for the global climate in the long-term or one that would be good for Stuttgart residents’ health and life in the short-term.

To contextualize this problem, one must also understand the history and economy of Stuttgart. The city of Stuttgart is Germany’s 7th largest city and the capital of the state of Baden-Württemberg. Its economy is built around the automobile industry, due to the headquarters of Daimler AG, Bosch, Mahle, and Porsche in the Stuttgart area. Over 110,000 people in the Stuttgart area are directly employed by the automobile industry, whereas a total of 200,000 people work for businesses that generate a significant percentage of their revenues through the automobile industry. Almost 45 percent of all the revenues generated in the area are related to this key industry (Region Stuttgart, n.d.). The first car in the world was built in Stuttgart 130 years ago and since then Stuttgart has become one of the centers of Germany’s famous car industry. To understand the problem of air pollution and climate regulations, one has to understand this historical and for many involved very emotional relationship.

**Stakeholders**

Residents of the Stuttgart Area

Residents of the Stuttgart area hold arguably the biggest stake in this decision. Although it has to be distinguished between those living in the city and those living in one of the many suburbs, but work in the city. Especially, for those living in the city concerns about their health and life are essential, since they have no alternative but to breath the air that surrounds them, although that might cause threats to their health (see Chapter 3.1. Health effects of air pollution).

What is more, residents of suburban areas, that work in the city might fear a ban of diesel cars, due to the significant inconveniences it causes to them on their way to work every day. Diesel fuel is cheaper than regular gasoline in Germany, due tax benefits, although diesel fueled cars are generally more expensive. If diesel cars are banned, individuals that relied on their diesel car to get to work, either have to sell it and buy gasoline car or use public transport if possible. Both those options are inconvenient and sometimes not affordable for less-wealthy individuals.

Last, but not least, residents of the Stuttgart area have a stark interest in the automobile industries’ success, since that is what empowers the region’s economy and provides a secure and good- paying job for many in the region. Setting a precedent by banning diesel cars could lead to a chain reaction in many German cities and impact car sales and, therefore, the automobile industry.

Overall, residents although tend to favor temporarily banning diesel cars. In a poll conducted by the renown Forsa polling institute, 55 percent of people living in the city and 57 percent of people living in the suburbs favor such regulations in areas where a high air pollution can be measured (Schwarz, 2017).

State Government

The state government consists of a coalition of center-left Alliance 90/The Greens and the center-right Christian Democratic Union of Germany or CDU. The green party’s core theme is based around environmentalism and preventing further climate change. Many in its base have anti-automobile industry sentiments, which is why they would probably, although I could not find any surveys that could back that up, favor a ban on diesel cars. The CDU, however, is also part of the Federal Government led by Chancellor Dr. Angela Merkel (CDU), who has promised multiple times that Germany accomplish the 2020 World Climate Goals (Merkel ist überzeugt, 2011). If banning diesel cars could threaten that goal the Chancellor, who is also head of her party might put pressure on her fellow party members in the Stuttgart area to let go of those bans.

On the other hand, polls show that Stuttgart residents are in favor of banning diesel cars (Schwarz, 2017). To win their votes in the next election it might be necessary to take a stance in favor of a ban on diesel cars.

Local Businesses

Local Businesses that rely on diesel cars in their fleet (i.e. taxi operators, postal services, moving agents, plumbers etc.) could be forced to buy gasoline powered cars or electrical vehicles, which would constitute expenditures that they cannot afford. Therefore, those businesses would have a big stake in this decision, because they might have to adjust their entire business model due to it.

Car Sharing Companies

Car sharing companies like Car2Go or DriveNow, are becoming more and more popular (Hüetlin, 2013). Many companies’ fleets are largely based on electric cars, which would not be affected by a diesel ban. Therefore, they could win over new customers and expand their business to more rural areas in the suburbs. After the city banned driving cars that do not meet the “EURO 6” standards on certain days (“Feinstaubalarm”) when the pollution of the air in the city through nitrogen dioxide and particulate matter (PM) exceed certain limits, car sharing provider Car2Go’s customers on those days increased by 20 percent (Löhle, 2017).

Automobile Industry

The automobile industry, especially the German manufacturers, rely heavily on diesel cars in their business model. 66.3 percent of all newly registered Audi cars, 65.5 percent of all newly registered BMW’s and 56.1 percent of all newly registered Mercedes-Benz cars in Germany have a diesel engine (Grafik des Tages, 2017). Therefore, they want to keep their customer’s trust in this technology up. A ban of diesel cars in certain cities could lead to decreased sales in diesel cars and, therefore, less profits.

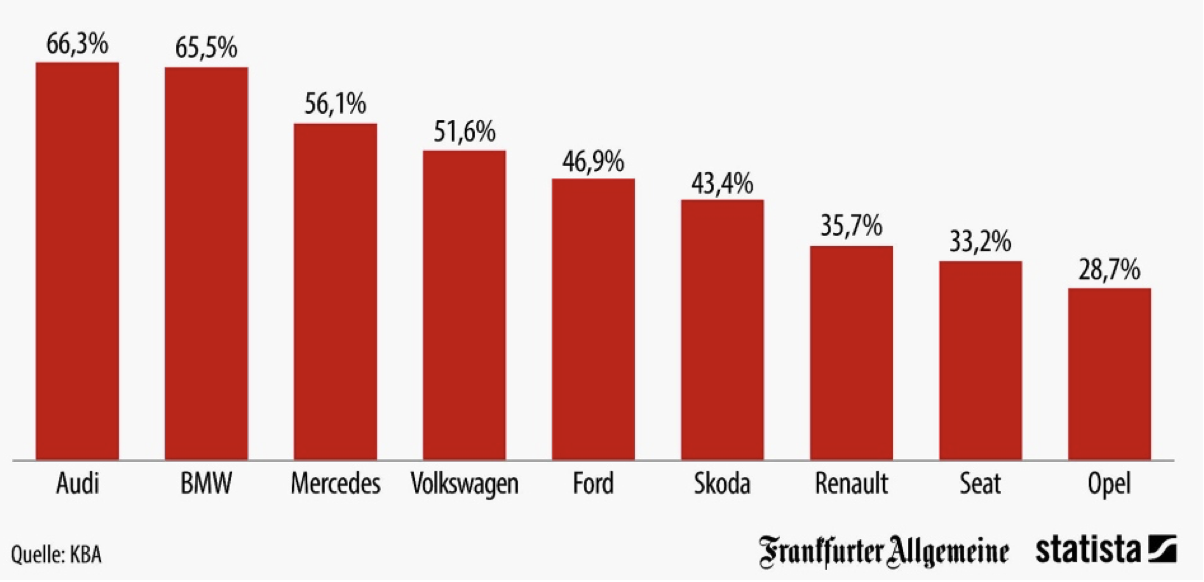


Figure : Share of diesel cars of all newly registered cars in Germany in 2016 (Grafik des Tages, 2017).

**Science**

To provide the state government with a recommendation on whether or not they should implement a ban on diesel cars, one has to weight the health effects of the air pollution caused by diesel engines against the effects it will have on the overall climate. In this chapter I will analyze those effects based on scientific findings published in peer reviewed journals.

Health effects of air pollution

An *air pollutant* is defined as “any substance which may harm humans, animals, vegetation or material” (Kampa & Castanas, 2008). There is a wide range of air pollutants that effect human health and they are mostly caused by burning fuel in order to generate energy for transport or manufacturing. However, they can be grouped into four categories:

* Gaseous pollutants (e.g. SO2, NOx, CO, ozone, Volatile Organic Compounds).
* Persistent organic pollutants (e.g. dioxins).
* Heavy metals (e.g. lead, mercury).
* Particulate Matter (PM).

In my analysis of the effects on human health I am going to focus on the effects of gaseous pollutants, especially nitrogen dioxide, and particulate matter or PM, since they are the main pollutants mentioned in the initial administrative court decision that fueled the debate (Gericht ebnet Weg, 2017).

Health effects of gaseous pollutants

Gaseous pollutants in the atmosphere are mainly due to combustion of fossil fuels (Katsouyanni, 2003). Findings show that all air pollutants, also gaseous pollutants, contribute to increased mortality and hospital admissions (Brunekreef & Holgate, 2002). Studies of the Harvard Medical School in Boston, MA, show that nitrogen dioxide and P2.5, a type of particulate matter, are associated with life-threatening arrhythmia leading to therapeutic interventions by an implanted cardioverter defibrillator (Peters, Liu & Verrier, et al., 2000). Nitrogen dioxide and particulate matter were also associated with causing bronchitis, but no asthma (Brunekreef & Holgate, 2002).

Health effects of particulate matter

Particulate matter is defined as “a type of air pollutants, consisting of complex and varying mixtures of particles suspended in the breathing air, which vary in size and composition, and are produced by a wide variety of natural and anthropogenic activities” (Kampa & Castanas, 2008; Pöschl, 2005). The effect of particulate matter on shortening life expectancy is estimated at 1–2 years for realistic exposure contrasts, a very substantial risk compared to other risk factors (Brunekreef, 1997). Data shows that all-cause daily mortality increases by 0.6 percent for each 10 μg/m3 increase in PM10, one type of particulate matter (Brunekreef & Holgate, 2002). The city of Stuttgart currently calls out a “Feinstaubalarm” (English: Particulate matter alarm) when the pollution exceeds the threshold of 50 μg/m (Aktuelle Schadstoff- und Lärmsituation, 2017). For the Netherlands, a country with a population of 16 million and an average PM10 concentration of >30 μg/m, an estimated 2,100 deaths per year are attributed to air pollution. That is almost twice as much as the number of deaths in traffic accidents admissions (Brunekreef & Holgate, 2002). Those numbers speak to the immense threats to human health and life that are caused by air pollution.

Particulates caused by burning diesel have also been linked to long-term effects on allergic individuals, due to the increase of the synthesis of IgE, an allergic antibody that increases sensitization to common allergens (Diaz-Sanchez, Fujieda & Saxon, 1998). Those effects could be lessened by a diesel car ban in the city.

Effects of diesel vs. gasoline powered cars on the climate

As I cited in Chapter 1, opponents of the diesel ban argue that without the clean diesel technology, people will buy more gasoline cars and that will make it impossible for Germany to achieve the 2020 World Climate Goals and further increase the threat climate change causes to the world (Laschet, 2017; Höning & Marschall, 2017). But is that true?

It is true, that diesel cars obtain 25 to 35 percent better mileage and emit less carbon dioxide than similar gasoline cars (Jacobson, 2002). Increasing carbon dioxide levels are the major cause climate change and sea level rise (Solomon, Plattner, Knutti & Friedlingstein, 2009). However, Mark Z. Jacobson, associate professor of civil and environmental engineering at Stanford University, argues in his 2002 paper "Control of fossil-fuel particulate black carbon and organic matter, possibly the most effective method of slowing global warming" that appeared in the *Journal of Geophysical Research­Atmospheres,* that although diesel cars emit less carbon dioxide, they can emit 25 to 400 times more mass of particulate black carbon and associated organic matter ("soot") per kilometer (Jacobson, 2002). Jacobson argued in an article for the *Stanford News Service* that “[n]ot only does soot warm the air to a much greater extent than does carbon dioxide per unit mass, but the lifetime of soot in the air (weeks to months) is much less than is that of carbon dioxide (50 to 200 years). As such, removing soot emissions may have a faster effect on slowing global warming than removing carbon dioxide emissions.” (Jacobson (2), 2002). I searched through the Google Scholar data base using key words “diesel”, “carbon dioxide”, “climate”, and “emission” and examined 11 articles but found no disconfirming evidence.

**Recommendations**

I would recommend the state government to follow the ruling of the administrative court and implement permanent bans on diesel cars that do not meet certain standards. Not only would that be popular with their constituents (Schwarz, 2017), but also improve their health and the air quality. I would, however, recommend to provide the people of Stuttgart with a guarantee that, once implemented, the standards on diesel cars do not change for a long time (i.e. 15 years) to assure them that they can invest their money in clean modern diesel cars that meet the standards without fear of a new ban. This assurance would also benefit the automobile industry, since they can meet the new standards and by doing that assure their customers that buying their diesel cars is a good investment. However, I think the government should provide a fund where small businesses can borrow money, if they do not have the capital to invest in a new fleet of clean cars.

I think the immediate health and life of the people of Stuttgart is at threat. This threat outweighs, in my opinion, the threat caused by globally insignificant increase in carbon dioxide in the atmosphere. Furthermore, I think the state can use other tools to decrease carbon dioxide by, for instance, improving public transport systems and making them more affordable and subsidizing e-car sharing services.

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## Get Out Into Your Community

*Instructions:*

Working in pairs or trios, students will take advantage of opportunities beyond our university, in our city or elsewhere, to engage with some issue in climate and energy. Students will write a short paper on their project and report back to the class about what they learned both from the experience and about the experience. Choose something that interests you!

The paper should address these questions: Why did you choose this experience, and how is it appropriate to our course? In terms of our chapter topics (the truth, the risks, the stakes, the business of business, global leadership), what did you learn? How is what you learned useful to systemic leaders, in particular? 1000-1200 words please.

*Sample events:*

* Attend State House hearings on a climate bill.
* Attend an open house with your government representative (state or federal) in which you ask about pending climate and energy legislation.
* Attend hearings or meetings in your town that relate to climate and energy. Consider visiting Jamaica Plain, a local environmental leader.
* Attend a climate or energy conference.
* Attend research presentations at local institutions.
* Attend a talk by a climate activist.
* Attend events sponsored by the local Climate Action Network.

## Lead Discussions

*Length:* 45-50 minutes per discussion

*Instructions:*

Leaders must be conversant with climate terminology and analysis. In this exercise, in pairs (and the occasional trio), students will lead class discussions of some of the key issues in our textbook (André) and readings, beginning with Chapter 1. On the syllabus these discussions are labelled D1 through D6 after the book chapters (beginning with Chapter 1, e.g. Practice 1); most chapters have two discussions. The discussions must run 45-50 minutes.

As leaders, consider that there may be many factors in a discussion—providing information, asking questions, using the dialogue discussion technique, creating short exercises that provoke discussion, using groups to pre-think topics for the larger group, and so on. Students participating in the discussion should also be well versed in the assigned chapter, so you may want to remind them in advance to read it.

Your goal is to develop an informed, meaningful discussion of the issues that stimulates critical thinking.

The discussion topic numbers refer to the corresponding chapters in *Lead for the Planet: Five Practices for Confronting Climate Change.*

Discussion 1A: What is the truth?

Discussion 1B: What factors stand between you and getting the truth, and what can you do about them?

Discussion 2: Discuss the Wright and Nyberg quote on the abilities of markets and capital versus the need for dramatic emissions reductions.

Discussion 3A: What is the future of renewable energy as a competitor of fossil fuels?

Discussion 3A: What is the future of renewable energy as a competitor of fossil fuels?

Discussion 3B: Pose the stag hunt dilemma to the class in both its simple and complex versions, and discuss its implications.

Discussion 4A: Discuss legal scholar Lynn Stout’s assessment of business’ ability to serve the public interest.

Discussion 4B: Climate leaders may be subject to emotional labor and burnout. Relate this problem to similar issues faced by other workers, students in business schools, and students on coop.

Discussion 5A: What are carbon fees and cap and trade and how much of the global climate and energy problem are they likely to solve?

Discussion 5B: Discuss the future of ecological economics and rationing in light of democratic government.

Discussion 6: Can we design a plan for the planet that takes human decision making into account? What *should* be that plan in terms of content (actions)? In terms of process (global leadership)?

*Learning Goals:*

Design a long presentation that engages the class.

Manage a discussion on a complex topic in climate and energy.

# Sample Undergraduate Syllabus

**Developing Leaders for Global Sustainability**

*Introduction:*

We hear a lot these days about the "what" and the "why" of planetary change. Yes, climate change is happening and humans are creating it by burning fossil fuels. Yes, it’s melting the Arctic and causing disruptions across the globe. And, yes, it’s accelerating. We hear a lot less about the "who" and the "how" – about the leaders and organizations that are addressing the climate and energy challenges.

In this course we consider current climate and energy realities and ask questions about how humanity is addressing them. What do leaders know now? What more must they know? How can the science of human behavior and systems help us to craft the best possible decisions and interventions? These inquiries boil down to one great question: Can Team Humanity step up to save the planet?

Sustainability leaders are characterized by specific analytic and implementation skills, including being scientifically literate, understanding risk and stakeholder relationships, and being able to implement change both within and outside their organizations. To advocate effectively for environmental sustainability, leaders must *also* have courage, vision, and persistence. Such personal qualities are most likely to emerge when individuals are grounded in what they believe about the fundamental scientific truths and key power relationships that today determine the sustainability of the natural environment and our society. Practicing leadership skills based in such knowledge is the purpose of our course.

*“The one thing good leaders have in common is a willingness to let new evidence change their views.”*

*--Korn/Ferry management consultants, in The Economist April 6, 2013*

Our working definition of sustainability for this class is “the obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are.” “Global sustainability” refers to sustainability for the world.

*Required Reading/Viewing:*

André, Rae. *Lead for the Planet: Five Practices for Confronting Climate Change*

Del Vecchio. Global warming vocabulary. <https://keioglobalchallenges.wordpress.com/2012/04/10/global-warming->

The Carbon Cycle. <https://earthobservatory.nasa.gov/Features/CarbonCycle/>

Your Local Research Librarian. Connect with them to learn about the best data bases.

*Assignments:*

**Exam: Science and Leadership Basics 20%** Multiple choice. Includes all material up until the exam.

**Group Project 20%** **Get Out into Your Community** In pairs (mainly), students will identify and visit local institutions that present climate and energy research, develop policy, or pursue political action. They will report back to the class on their visit, and prepare a short paper describing the experience and what they took away from it.

**White Paper 35%** Students will analyze the science and stakeholders in a current climate or energy issue of their choice in order to make recommendations to a “client.” Personalizing the project to your particular interests is highly encouraged.

**Class Contribution** **25%**

Class contribution includes such factors as leading, participating, and doing any homework.

*Leading a discussion*. Leaders speak with authority. In this class I want you to develop your ability to speak about climate and energy with your peers and colleagues. Therefore…in pairs (and the occasional trio), students will lead class discussions of some of the key issues discussed in our textbook, beginning with Part 1. On the syllabus these discussions are labelled D1 through D6 after the book chapters (beginning with Chapter 1); most chapters have two discussions. The discussions must run 45-50 minutes. As leaders, consider that there may be many factors in a discussion—providing information, asking questions, using dialogue (see below), creating short exercises that provoke discussion, using groups to pre-think topics for the larger group, and so on. Informed, meaningful discussion of the issues is what we’re looking for. Students participating in the discussion should also be well versed in the chapter.

|  |  |
| --- | --- |
| **READINGS** | TOPICS AND ASSIGNMENTS (Tentative based on Class Size) CLASSES RUN FOR 100 MINUTES. |
| 1.1/8  **Introduction: Team Humanity**  Del Vecchio-- Global warming vocabulary. <https://keioglobalchallenges.wordpress.com/2012/04/10/global-warming-> | Introduction/s  Notes: BB=Blackboard, PP=Powerpoint.  All the readings are from André unless otherwise noted.  Note that for discussions, participants are assigned to read the chapters carefully. |
| 2. 1/10  Chapter 1: The Truth | The state of the planet and how we got here  PP Scientific Literacy with Paleoclimatologist Peter Ward |
| 3. 1/17 | Discussion 1A: What is the truth?  Discussion 1B: What factors stand between you and getting the truth? |
| 4. 1/22 | **Political history**  An Inconvenient Truth (film) |
| 5. 1/24 | (continued)  PP Update |
| 6. 1/29  Chapter 2: The Risks | **Risk assessment and management**  PP Risk  Discussion 2: Discuss the Wright and Nyberg quote on the abilities of markets and capital versus the need for dramatic emissions reductions. |
| 7. 1/31 | **Practical risk analysis**  Simulation for a White Paper risk analysis: Drought in the San Joaquin Valley |
| 8. 2/5  Chapter 3: The Stakes | **Exam: Science and Leadership Basics.**  Covers Andre Introduction, Chapter 1, and Chapter 2 and all class material to date. |
| 9. 2/7 | **Fossil fuels versus renewables; heavy oil; community impacts and politics**  The Tipping Point (film)  PP Oil  Hunt for Oil |
| 10. 2/12 | (continued) |
| 11. 2/14  Chapter 4: The Business of Business | Discussion 3A: What is the future of renewable energy as a competitor of fossil fuels? Discussion 3B: Pose the stag hunt dilemma to the class in both its simple and complex versions, and discuss its implications. |
| 12. 2/21 | Strong versus weak sustainability initiatives  Discussion 4A: Discuss legal scholar Lynn Stout’s assessment of business’ ability to serve the public interest. |
| 13. 2/26 | Discussion 4B: Climate leaders may be subject to emotional labor and burnout. Relate this problem to similar issues faced by other workers, students in business schools, and students on coop. |
| 14. 2/28 | Nate Hagens, Thought Leader |
| 15. 3/12  Chapter 5: Global Leadership  Roxanne Palmatier on NU research materials. | What should global, systemic leaders know and do?  PP Ecological economics and rationing with Stan Cox interview (NPR)  Due: White Paper Topic (hard copy please). See details of the White Paper Assignment below. |
| 16. 3/14 | Discussion 5A: What are carbon fees and cap and trade and how much of the global climate and energy problem are they likely to solve?  Discussion 5B: Discuss the future of ecological economics and rationing in light of democratic government. |
| 17. 3/19 | **Community impacts and influence**  Gasland I (film) |
| 18. 3/21 | (continued)  Due (Optional): White Paper Design |
| 19. 3/26  Conclusion: The Plan | **What’s the plan?**  Discussion 6A: Is human nature competitive or cooperative? |
| 20. 3/28 | (continued)  Discussion 6B: What *should* be the plan? Can we design a plan that takes human decision making into account? Should we even have a plan? |
| 21. 4/2 | Due: Group project paper due.  Group project presentations (informal). |
| 22. 4/4 | **Where are we now?**  How to Let Go of the World and Love all the Things Climate Cannot Change (film, if time). Dialogue, as useful.  Discussion 7: What should each of us do now, and later, to mitigate/adapt to/lead in the face of climate change? |
| 23. 4/9 | (continued). |
| 24. 4/11 | Due: White Paper.  Authors discuss their research and conclusions (informal). |
| 25. 4/18 | Conclusion and celebration. Final dialogue. Course evaluation. |

# Appendix 1

## Science Literacy Quiz: Answers

1. The average global temperature on Earth has increased by 0.8°Celsius since 1880. How much is the increase when stated in Fahrenheit?

Note that a degree differs from a temperature scale! A **change in temperature** of 1 "degree" Celsius is equivalent to a change of 1.8 "degrees" Fahrenheit. The two types of degrees are of different sizes, so the calculation to compare one to the other is simply, in this case, .8 x 1.8, or 1.44 degrees F.   
  
When comparing the Celsius and Fahrenheit *scales*, the **temperature reading** of 1 degree Celsius is equivalent to a Fahrenheit reading of (32 + 1.8) = 33.8 degrees Fahrenheit.  
  
F=9 c/5 +32   
c=1   
F=9\*1/5 +32   
=9/5+32   
=1.8+32   
F=33.8   
so a temperature reading of 1 °C is 33.8 °F

Is the increase important? “The world is getting warmer. Whether the cause is human activity or natural variability—and the preponderance of evidence says its likely humans—thermometer readings all around the world have risen steadily since the beginning of the Industrial Revolution…According to an ongoing temperature analysis conducted by scientists at NASA’s Goddard Institute for Space Studies (GISS) and shown in this series of maps, the average global temperature on Earth has increased by about 0.8°Celsius (1.4°Fahrenheit) since 1880. Two-thirds of the warming has occurred since 1975, at a rate of roughly 0.15-0.20°C per decade…

The global temperature record represents an average over the entire surface of the planet. The temperatures we experience locally and in short periods can fluctuate significantly due to predictable cyclical events (night and day, summer and winter) and hard-to-predict wind and precipitation patterns. But the global temperature mainly depends on how much energy the planet receives from the Sun and how much it radiates back into space—quantities that change very little. The amount of energy radiated by the Earth depends significantly on the chemical composition of the atmosphere, particularly the amount of heat-trapping greenhouse gases.

A one-degree global change is significant because it takes a vast amount of heat to warm all the oceans, atmosphere, and land by that much. In the past, a one- to two-degree drop was all it took to plunge the Earth into the Little Ice Age. A five-degree drop was enough to bury a large part of North America under a towering mass of ice 20,000 years ago.”

http://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php

2. Define "hydrofracking.”

**Hydraulic fracturing** is the propagation of fractures in a [rock layer](http://en.wikipedia.org/wiki/Stratum), as a result of the action of a pressurized fluid… **[it]** is a technique used to release petroleum, [natural gas](http://en.wikipedia.org/wiki/Natural_gas) (including [shale gas](http://en.wikipedia.org/wiki/Shale_gas), [tight gas](http://en.wikipedia.org/wiki/Tight_gas) and [coal seam gas](http://en.wikipedia.org/wiki/Coal_seam_gas)), or other substances for extraction.[[a]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#endnote_anone)[[1]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-Charlez-0) This type of fracturing creates fractures from a [wellbore](http://en.wikipedia.org/wiki/Wellbore) drilled into reservoir rock formations.

The first use of hydraulic fracturing was in 1947 but the modern fracking technique that made the extraction of shale gas economical was first used in 1997 in the [Barnett Shale](http://en.wikipedia.org/wiki/Barnett_Shale) in Texas.[[1]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-Charlez-0)[[2]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-AutoZV-10-1)[[3]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-SPE-20-2)

Proponents of fracking point to the economic benefits from vast amounts of formerly inaccessible [hydrocarbons](http://en.wikipedia.org/wiki/Hydrocarbons) the process can extract.[[4]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-WEO2012_Special-3) Opponents point to potential [environmental](http://en.wikipedia.org/wiki/Environment_%28biophysical%29) impacts, including contamination of [ground water](http://en.wikipedia.org/wiki/Ground_water), risks to [air quality](http://en.wikipedia.org/wiki/Air_quality), the migration of gases and hydraulic fracturing chemicals to the surface, surface contamination from spills and flowback and the [health effects](http://en.wikipedia.org/wiki/Health_effect) of these.[[5]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-HeatOnGas-4) For these reasons hydraulic fracturing has come under scrutiny internationally, with some countries suspending or even banning it.[[6]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-Bweek_31.03.2011-5)[[7]](http://en.wikipedia.org/wiki/Hydraulic_fracturing#cite_note-Bweek_04.10.2011-6) Source Wikipedia 2012.

3. Define "peak oil."

**Peak oil** is the point in time when the maximum rate of [petroleum](http://en.wikipedia.org/wiki/Petroleum) [extraction](http://en.wikipedia.org/wiki/Extraction_of_petroleum) is reached, after which the rate of production is expected to enter terminal decline.[[1]](http://en.wikipedia.org/wiki/Peak_oil#cite_note-0) "No one doubts that fossil fuels are subject to depletion." Every oil well and field exhibits similar characteristics of being discovered, the logistics to extract the oil being put in place, a peak or plateau of production, followed by a decline.[[2]](http://en.wikipedia.org/wiki/Peak_oil#cite_note-1) … There is active debate as to how to measure peak oil, and which types of liquid fuels to include. Most of the remaining oil is from unconventional sources. Rough estimates indicate that out of an available 2 trillion barrels of oil, about half has been consumed. Wikipedia. 2012.

4. What is "An Inconvenient Truth" and what is the inconvenient truth it refers to?

“An Inconvenient Truth” is a film narrated by Al Gore that portrays his lectures about the inconvenient truth of global warming and climate change. The Nobel Peace Prize 2007 was awarded jointly to Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold (Al) Gore Jr. *"for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change" http://www.nobelprize.org/nobel\_prizes/peace/laureates/2007/*

5. Carbon dioxide is often measured in “ppm.” What does “ppm” stand for and why is it important in climate change science?

*One part per* [*million*](http://en.wikipedia.org/wiki/Million) (**ppm**) denotes one part per 1,000,000 parts. Source: Wikipedia.

“Global warming is mainly the result of CO2 levels rising in the Earth’s atmosphere. Both atmospheric CO2 and climate change are accelerating. Climate scientists say we have years, not decades, to stabilize CO2 and other greenhouse gases. To help the world succeed, CO2Now.org makes it easy to see the most current CO2 level and what it means. So, use this site and keep an eye on CO2.” Source: CO2Now.org --2012.

* In 2018 proven crude oil reserves in the United States were estimated to be 43,800,000,000 barrels. <https://www.eia.gov/naturalgas/crudeoilreserves/> At rates of US usage, and assuming no oil is imported, how long would this oil last our country?

6. In 2018 US proven crude oil reserves were estimated to be 43,800,000,000 barrels. At rates of usage, and assuming no oil is imported, how long would this oil last our country?

The US consumes about 20% of the world production of crude oil, or roughly 20 million barrels per day. <https://www.statista.com/statistics/271823/daily-global-crude-oil-demand-since-2006/>

43,800,000,000/20,000,000=2190 days 2190/365=6 years

1. How many barrels of oil are used daily in the world? How long will it last?

The world consumes roughly 100 million barrels of crude oil per day (pre-Covid). Source (and Covid update): <https://www.statista.com/statistics/271823/daily-global-crude-oil-demand-since-2006/>

Answering this question can be hard (finding the data) and confusing (what is being measured, exactly? Crude oil or crude oil along with ‘liquid fuels.” ) Here’s a good summary on “crude oil”, followed by one on “oil and liquid fuels.”

“In its latest [Statistical Review of World Energy](https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf), BP estimated the world had 1.7297 trillion barrels of crude oil remaining at the end of 2018. That was up from 1.7275 trillion barrels a year earlier and 1.4938 trillion barrels in 2008. In 1998, the world had 1.1412 trillion barrels in remaining reserves.

So, as demand has continued to grow consistently over the last 20 years, so has production and, counterintuitively, so have global oil reserves. Yet in that same statistical review, BP said these higher reserves would last us for just another 50 years: another metric oil companies use to measure their business sustainability.

Called reserves-to-production ratio, this simply means the oil reserves of a company—or a planet—at the end of any given year, divided by the production of oil during that year. The caveat here is that the R/P ratio only provides us with the length of time reserves will last if production continues at the same rate. In other words, the world would have enough oil for another 50 years if production remains at [82-84 million BPD](https://ycharts.com/indicators/world_crude_oil_production), which it averaged in 2018.”

Source: Drillers.com <https://drillers.com/how-much-oil-is-left-in-the-world/#:~:text=In%20its%20latest%20Statistical%20Review,trillion%20barrels%20in%20remaining%20reserves>.

Here’s an earlier, similar calculation that measures “oil and liquid fuels”:

For 2016, the IEA [*Oil Market Report*](https://www.iea.org/oilmarketreport/) forecasts worldwide average demand of nearly 96 million barrels of oil and liquid fuels per day – that works out to about 3 billion barrels a month or more than 35 billion barrels a year. Source: <http://www.iea.org/aboutus/faqs/oil/> accessed December 23, 2015.

If there are 1.5 trillion barrels of oil left, at 35 billion barrels per year it will last 52.5 years.

Issues:

1) Nobody really knows how much oil is left. However, there is some degree of certainty in the current guesses because finding oil is based on decent science.

2) in any particular report, how is oil defined? Observe that the above report refers to “oil and liquid fuels”. E.g. it includes oil *and* gas. Historically, oil meant conventional, light sweet crude. To illustrate the confusion, see what the IEA (above) writes:

“**What is the difference between conventional and unconventional oil?**

Conventional oil is a category of oil that includes crude oil and natural gas liquids and condensate liquids, which are extracted from natural gas production. Unconventional oil consists of a wider variety of liquid sources including oil sands, extra heavy oil, gas to liquids and other liquids. In general conventional oil is easier and cheaper to produce than unconventional oil. However, the categories “conventional” and “unconventional” do not remain fixed, and over time, as economic and technological conditions evolve, resources hitherto considered unconventional can migrate into the conventional category.”

8. What is ethanol and how is it used?

Ethanol, also called ethyl alcohol, pure alcohol, grain alcohol, or drinking alcohol, is a [volatile](http://en.wikipedia.org/wiki/Volatility_%28chemistry%29), [flammable](http://en.wikipedia.org/wiki/Flammability), colorless liquid…Best known as the type of [alcohol](http://en.wikipedia.org/wiki/Alcohol) found in [alcoholic beverages](http://en.wikipedia.org/wiki/Alcoholic_beverages), it is also used in [thermometers](http://en.wikipedia.org/wiki/Thermometers), as a [solvent](http://en.wikipedia.org/wiki/Solvent), and as a [fuel](http://en.wikipedia.org/wiki/Alcohol_fuel). In common usage, it is often referred to simply as alcohol or [spirits](http://en.wikipedia.org/wiki/Distilled_beverage).

The largest single use of ethanol is as a motor [fuel](http://en.wikipedia.org/wiki/Fuel) and [fuel additive](http://en.wikipedia.org/wiki/Fuel_additive).

More than any other major country, [Brazil](http://en.wikipedia.org/wiki/Brazil) relies on ethanol as a motor fuel. [Gasoline](http://en.wikipedia.org/wiki/Gasoline) sold in Brazil contains at least 25% [anhydrous](http://en.wikipedia.org/wiki/Anhydrous) ethanol. Hydrous ethanol (about 95% ethanol and 5% water) can be used as fuel in more than 90% of new cars sold in the country. Brazilian ethanol is produced from [sugar cane](http://en.wikipedia.org/wiki/Sugar_cane) and noted for high [carbon sequestration](http://en.wikipedia.org/wiki/Carbon_sequestration).[[68]](http://en.wikipedia.org/wiki/Ethanol#cite_note-WaPo-Brazil-67) The US uses Gasohol (max 10% ethanol) and E85 (85% ethanol) ethanol/gasoline mixtures. [US ethanol is made from corn.] wikipedia

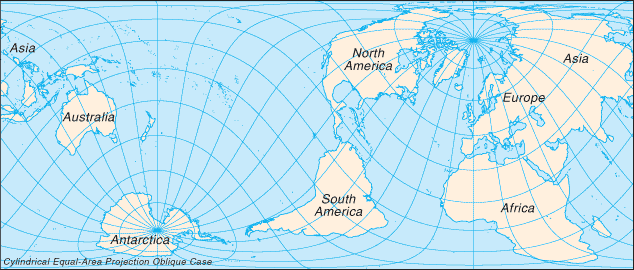
9. Draw a map of the world that includes the equator and the continents of the world. Use arrows to indicate which parts of the world (if any) are warming the fastest.

For years, climate scientists have believed that the Arctic would likely be one of the first regions to be affected by global warming and would likely experience greater warming than the rest of the world. Recent evidence has validated these concerns. While the world as a whole warmed about 1oF over the entire 20th century, parts of the Arctic have warmed by 4-5oF just since the 1950s.

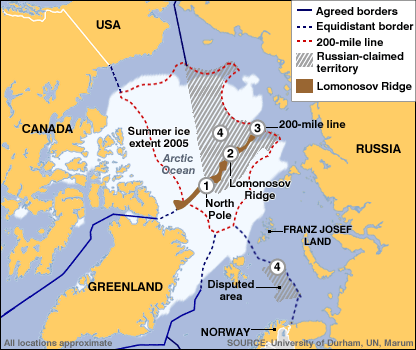
The Arctic continues to warm at a rate about twice as fast as rest of the world. Scientists, as well as the indigenous people of the Arctic, have noticed dramatic changes in the Arctic environment that has affected ecosystems and wildlife, human settlements and infrastructure, and the way of life of indigenous peoples.

<http://www.c2es.org/science-impacts/basics/faqs/arctic#8>

C2ES is the successor to the [Pew Center on Global Climate Change](http://www.c2es.org/about/history)



10. Draw a map of the North Pole and the seas and countries that surround it.



A 2008 United States Geological Survey estimates that areas north of the Arctic Circle have 90 billion barrels (1.4×1010 m3) of undiscovered, technically recoverable oil. Wikipedia, quoting United States Geological Survey, (USGS) (July 27, 2008). ["90 Billion Barrels of Oil and 1,670 Trillion Cubic Feet of Natural Gas Assessed in the Arctic"](http://www.usgs.gov/newsroom/article.asp?ID=1980). USGS. Retrieved 2008-08-12. Accessed August 30, 2012.

# Appendix 2

## State of the Planet Quiz: Answers and Sources

1. a
2. c
3. a
4. b
5. a
6. d
7. b

SOURCES

[https://www.giss.nasa.gov/research/news/20200115/](about:blank)

James Hansen, Makiko Sato, Reto Ruedy, Gavin Schmidt, Ken Lob, & Michael Hendrickson. (2020, January 15). Global Temperature in 2019. http://www.columbia.edu/~jeh1/mailings/2020/20200115\_Temperature2019.pdf. Accessed January 20, 2020.

[https://www.climate.gov/news-features/understanding-climate/climate-change-ocean-heat-content](about:blank)

[https://scripps.ucsd.edu/programs/keelingcurve/](about:blank)

[https://ss2.climatecentral.org/#12/42.3601/-71.0589?show=satellite&projections=0-K14\_RCP85-SLR&level=6&unit=feet&pois=hide](about:blank)

**Look around you. Kill half of what you see. Or if you’re feeling generous, just kill about a quarter of what you see. That’s what we could be talking about.”**  
–Anthony Barnosky, paleontologist, University of California–Berkeley. In Elizabeth Kolbert, *The sixth extinction: an unnatural history*. 2014.

# Appendix 3

## Stag Hunt Dilemma: Teaching Note

*The Dilemma: Version 1*

This is a moral dilemma that illustrates game theory and ethics (Rousseau, 1964; Verbeek and Morris, 2010.)

The hunter’s problem is about *assessing* (identifying, estimating) risks. First the hunter must assess the risk that the stag will not come against the risk that another hunter will kill the hare. Then, too, the hunter has to consider the risk that, if he defects from the group, he might be punished for his defection. If he kills the hare and tries to abscond with it, the other hungry hunters will fall on him and probably kill him. At the very least they will ostracize him. (And, in primitive times, loners didn't easily survive.)

*Discuss:*

Who and what are at risk here? How high are their risks? What is the right thing to do?

*The Dilemma: Version 2*

*Discuss:*

1. Why is Version 2 more true to life? Psychology (which is often the body of theory used to discuss Version 1) is an interesting discipline but its interpretations are piecemeal. We need anthropology, history and systemic ethics to understand Version 2.
2. Greed may be defined as killing the hare. It's getting there first. It's feeding the family. It’s collective, and it's tribal. Kill the fat bunny, run fast to the castle. Eat. Repeat. In Version 2, as in the world of economic reality, individuals exist not as lone hunters, but as hunters for their tribes: for their families, companies, and interest groups including social class. Under this situation, is greed good?
3. In this dilemma lies the paradox of the power of the tribe, the modern tragedy of nation states, and the future of the world. For thousands of years we have, for good reason, feared strangers from other tribes (Diamond, 2004). Yet, if I and my tribe kill the hare, we may start a war.
4. How well do loners survive today? What groups do you belong to and why?

References

Diamond, Jared. 2004. *Collapse: How Societies Choose to Fail or Succeed*. (Penguin Group USA Inc.)

# Appendix 4

# **Discussion Guide Questions: *Lead for the Planet***

1. These days most people accept the reality of climate change and are beginning to focus on how we, the members of Team Humanity, can address it. Before you read this book, had you ever thought about what it takes to be a leader for the planet? What did you believe about climate leadership? After reading the book, how has your viewpoint changed?
2. Who are some of the climate leaders that you know and admire? What traits do they possess that you think make them strong leaders for the planet?
3. In considering some of Team Humanity’s most important leaders, what societal sectors (business, government, non-profit) do they come from? What sectors do they influence? What are their main methods of influence?
4. In your opinion, how successful has Team Humanity been in confronting climate change?
5. What are the limits of cooperation? Are human beings mainly cooperative or mainly competitive?
6. Taking human nature into account, what are the best ways to address climate change?
7. Both the COVID-19 pandemic and climate change are “wicked problems,” which are defined as society-wide problems in which many parameters are unknown, issues are intertwined, and outcomes are uncertain. As problems, what do the pandemic and the climate crisis have in common? What lessons might we learn from the COVID-19 pandemic that could help Team Humanity address the climate crisis?
8. Will Team Humanity succeed in saving the planet? What are the implications of your answer for how we should live now?
9. What responsibility do colleges and universities have for teaching about climate change? What is a parent’s responsibility?
10. How might you yourself become a leader for the planet?

# **Chapter-Specific Questions**

*Practice 1: Get the Truth*

1. What factors stand between you and getting the truth, and what can you do about them?
2. How might you approach other people who have different ideas about “the truth”?

*Practice 2: Assess the Risks*

1. What are the main risks of global warming?
2. How do average individuals experience risk, and how do risk professionals see risk differently?

*Practice 3: Weigh the Stakes*

1. What is the future of renewable energy as a competitor of fossil fuels?
2. Can you provide a simplified version of the stag hunt dilemma? What about a complex version? Discuss their implications for human cooperation.

*Practice 4: Define the Business of Business*

1. Discuss legal scholar Lynn Stout’s assessment of the ability of business to serve the public interest.
2. In most organizations today, climate leaders are likely to experience emotional labor and burnout. Relate this problem to similar issues faced by other workers. How can this kind of burnout be avoided by climate leaders?

*Practice 5: Engage Global Leadership*

1. What are carbon fees? What is cap and trade? In your opinion, how much of the global climate and energy problem are they likely to solve?
2. To address the climate crisis, Team Humanity must ration critical resources now and in the future. Who should decide how resources will be rationed? What are some likely emotional consequences of rationing?

*Conclusion: What’s the Plan?*

1. What are the characteristics of a motivating plan to save the planet?
2. What are the best actions to take? Who are the best leaders to follow?

# Appendix 5

**Recommended Energy and Climate Media Coverage**

[The Energy Mix.](https://theenergymix.com/about-the-energy-mix/) Excellent free energy coverage with a Canadian perspective.

[The Daily Climate](http://www.dailyclimate.org/). Free media summary with timely updates.

**The Financial Times** has very broad energy coverage with an international perspective.

[Sustainababble.](http://www.sustainababble.fish/) British comedy podcast on the environment. Top notch guests and coverage. Pessimism meets resilience.