

Climate Change, What to do? How to Fix It?

Week 3

Economic Implications

Largest Coal Companies in the US

- Peabody Energy
- Arch Coal
- Alpha Natural Resources
- Cloud Peak Energy
- Consol Energy
- Combined produce 57% of the coal in the US according to the DOE

Coal Company Market Values

Company	8/5/2010	9/23/2016	Percent Change	Change in millions
Peabody	\$48.64	\$1.58	-97%	-\$13074
Arch	\$263.50	\$0.41	-99+%	-\$5602
Alpha	\$43.82	\$0.00	-100.0%	-\$9750
Cloud Peak	\$17.02	\$4.50	-74%	-\$764
Consol	\$38.82	\$17.40	-55%	-\$4905
Total				-\$34095

Why?

- Demand for coal domestically is off 20%
- Natural gas prices much more competitive
- Coal is dirty
- Regulation forces electric companies to renewable energy
- Regulation on emissions makes burning coal more expensive

Externalities

- In [economics](#), an **externality** is the cost or benefit that affects a party who did not choose to incur that cost or benefit.
- For example, manufacturing activities that cause [air pollution](#) impose health and clean-up costs on the whole society, whereas the neighbors of an individual who chooses to fire-proof his home may benefit from a reduced risk of a fire spreading to their own houses. If external costs exist, such as [pollution](#), the producer may choose to produce more of the product than would be produced if the producer were required to pay all associated environmental costs.

Externalities

- Scarce Resources
 - Seafood
 - Water
- Ecosystem Services
 - Carbon sequestration and climate regulation
 - Purification of water and air
 - Waste decomposition and detoxification

Market Values of Major Oil Companies

Company	Market Value on 9/23/2016 \$Billions
Exxon Mobil	\$347.03
Chevron	\$187.84
BP	\$106.28
Royal Dutch Shell	\$201.371
Total	\$842.521

- “It is clear that global warming could bankrupt the (\$2 trillion global property and casualty insurance) industry.” Frank Nutter, President, American Reinsurance Association

Costliest Hurricanes in millions 2015 dollars

1. Katrina \$49047
2. Andrew \$24111
3. Sandy \$19563

- Illinois Lawsuit by Farmers
- Florida situation
 - Significant losses from hurricanes
 - Insurance companies raised premiums
 - State legislature denied premium increases
 - Companies left state
 - State assumed risk in self-insured pool
- Transfer of cost from wealthy to the middle class.
- Florida governor and Sen. Marco Rubio are deniers. Miami Beach mayor says “we are way past debating about climate change.”
- If climate changes is a hoax, why are we paying for it?

Exercise 1

You are a member of the Exxon/Mobil Board of Directors. With 2014 revenues of \$394 billion, net income of \$33 billion and market capitalization of \$347 billion Exxon Mobil is one of the largest 5 companies in the world. All is not well however. Climate change initiatives pose a very real threat to both the value and the continued existence of the business. In order to keep global warming to the 2 degree Centigrade limit posited by international climate experts, 80% of Exxon's reserves would have to be left in the ground with a consequent 45% reduction in the market value of the company.

The Chairman has called a weekend strategic planning retreat (highly secret) to discuss options for the future of the company. Options include:

1. Fund scientific research to debunk climate change and use campaign contributions and lobbying efforts to control legislators from actions negative to the company.
2. Use the company's considerable financial resources to transition the company into other lines of business not harmful to the environment.
3. Develop vehicle engines that can burn fossil fuel without emitting carbon dioxide into the atmosphere.
4. Other?

The Board must decide what to do.

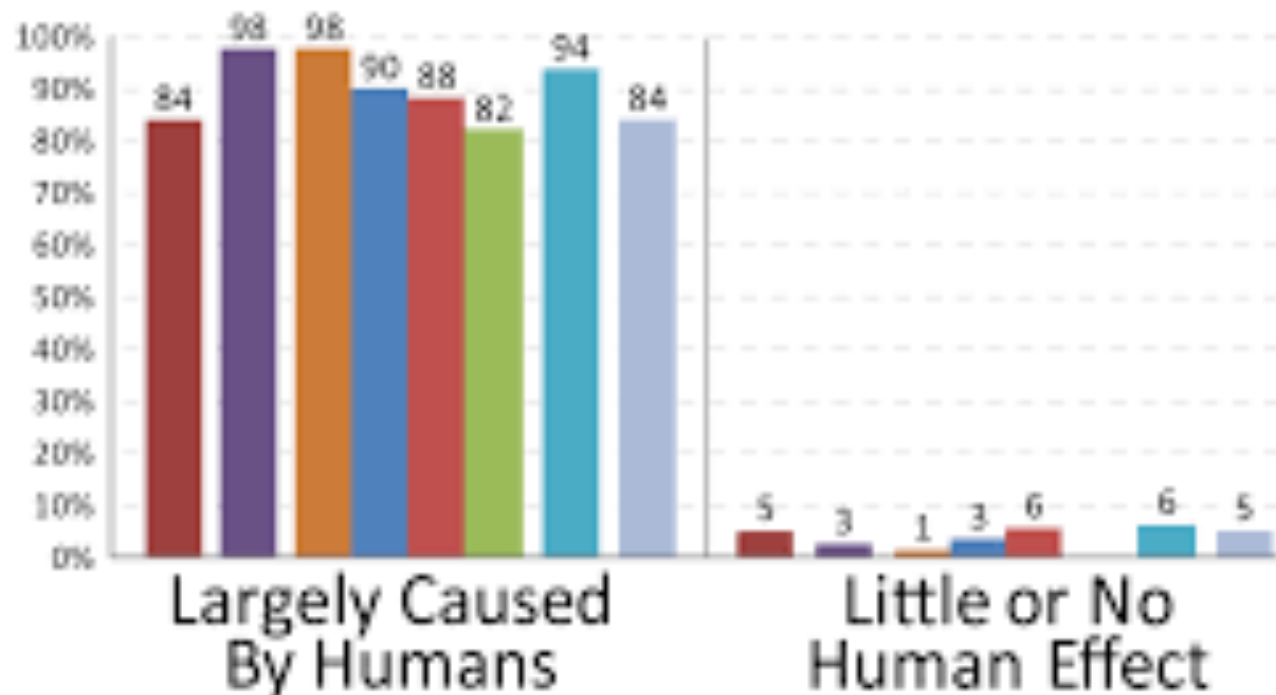
Exercise 2

- You are a member of the IREA Board of Directors. IREA is Colorado's largest rural electric cooperative with 152,300 customer/members over 5000 square miles. IREA is facing a crisis. Expected legislation as a result of the Paris Climate Accord will require IREA to significantly increase the percentage of its electric capacity coming from renewable resources such as solar and wind. Additionally IREA's coal suppliers are in severe financial trouble and several of them have filed for bankruptcy or closed their doors. From a small base a significant number of IREA's customer/members have installed solar systems. Tesla has introduced a home storage battery. As the storage technology improves, distributed production of electricity will explode further threatening IREA's business in what IREA's general manager calls a "game changer." IREA has an "all requirements" contract with XCEL Energy and has also made a \$366 million investment in XCEL's coal fired generating station (Comanche, Colorado's largest) in Pueblo. What will you do? Options include:
 - 1. Sell the investment in the Comanche power station and renegotiate the contract with XCEL, while simultaneously developing renewable power sources.
 - 2. Redefine the business and begin partnering with customers for distributed production of electricity via renewable energy.
 - 3. Continue current operations, using lobbying to fight increases in renewables percentages.
 - 4. Other?

Exercise 3

- With revenues of \$211 billion Berkshire Hathaway is the largest insurance company in the world. With climate change causing sea level rise and an increase in extreme weather events, Berkshire Hathaway faces catastrophic claim losses from flooding, storms, fires, etc. Additionally, certain states such as Florida have severely limited premium hikes to compensate the company for the increased risk. Your group has been selected as an advisory panel to Berkshire Hathaway Chairman Warren Buffet and asked to come up with strategic options and recommendations to ensure the company's continued survival and success. Options might include:
 - 1. Get out of the property/casualty business in areas likely to be affected by climate change.
 - 2. Sell the businesses before anyone figures out what's going on.
 - 3. Begin to increase premiums now in anticipation of the losses and lay off some of the risk to reinsurance providers
 - 4. Other?

Opinions of Climate and Earth Scientists on Global Warming



Farnsworth & Vichler (2011)

■ AGU / AMS Member Scientists

Andersson et al. (2010)

■ 200 Most Published Climate Scientists

Doran & Zimmerman (2009)

■ Most Frequently Published Climatologists

■ Scientists Publishing on Climate Change

■ Climatologists

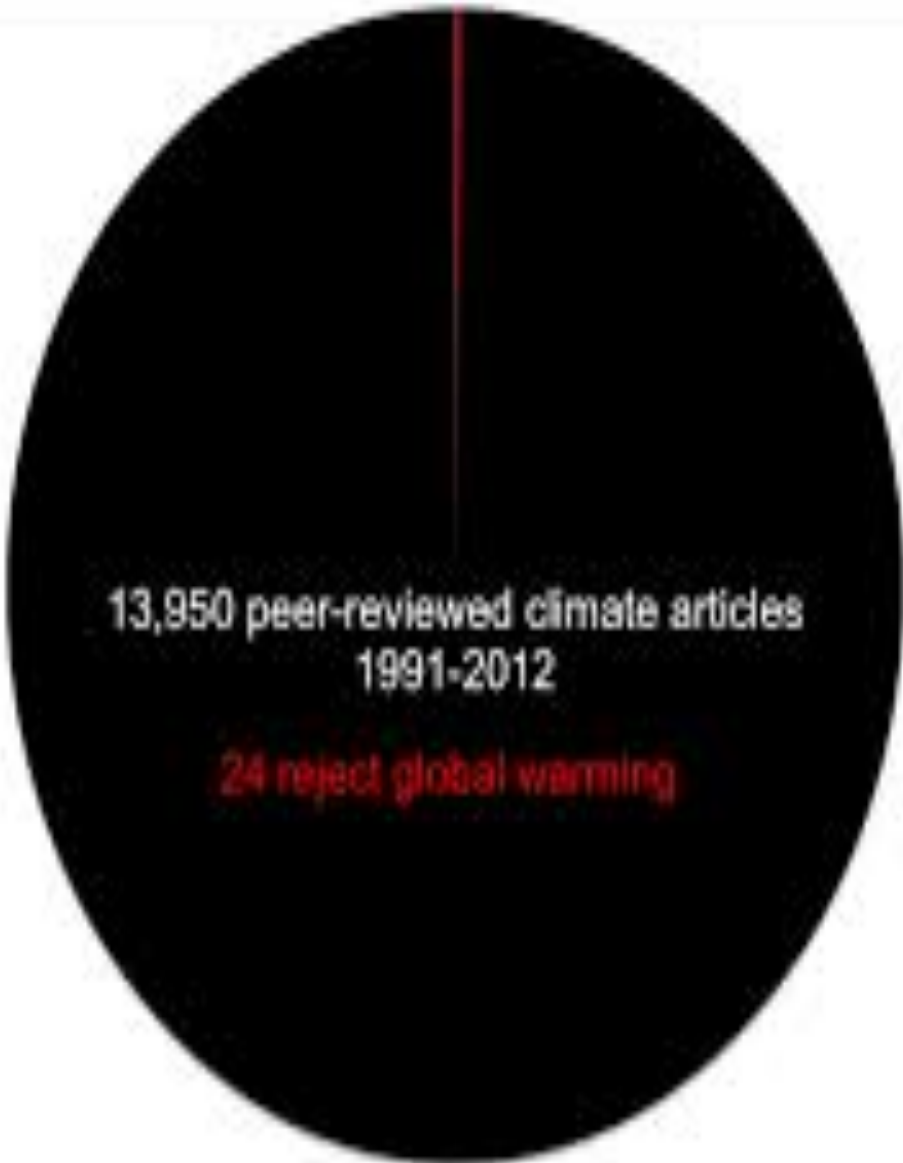
■ Earth Science Faculty / Researchers

Bray & Von Storch (2008)

■ Climate Scientists

STATS / Harris Interactive (2007)

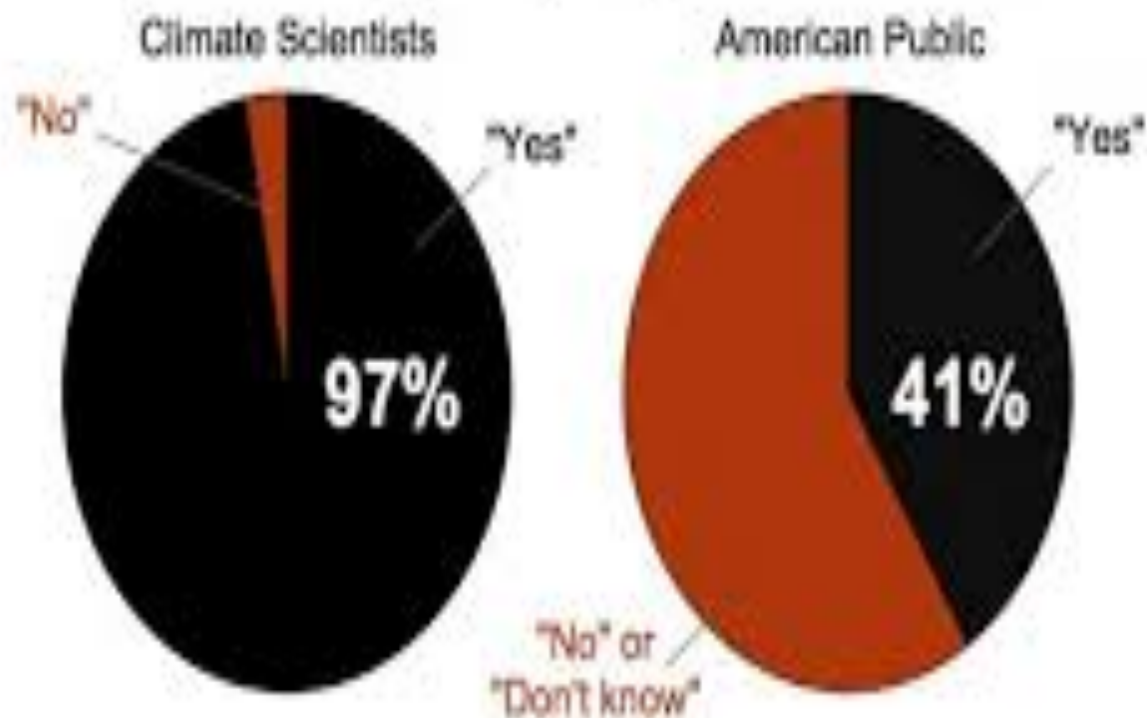
■ AGU / AMS Member Scientists



13,950 peer-reviewed climate articles
1991-2012

24 reject global warming

Say Climate Change is Happening and Human Caused



Left: Proportion of peer-reviewed research papers that stated a position on the reality of human-caused global warming and said that it is happening and human caused (Cook et al. 2013). Right: Proportion of the American public that says climate change is happening and human caused (Leiserowitz et al. 2013).

Merchants of Doubt by Naomi Oreskes and Erik Conway

- How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming
- “This book deserves serious attention for the lessons it provides about the misuse of science for political and commercial ends.” Publishers Weekly
- ...“It explains how over the past several decades mercenary scientists have partnered with tobacco companies and chemical corporations to help them convince the public that their products are safe—even when solid science proves otherwise...” Christian Science Monitor

Fred Seitz

- BS Stanford/PhD Princeton
- President National Academy of Sciences
- President Rockefeller University
- Retired 1979 age 68
- Became consultant to tobacco industry and played a key role... in helping the tobacco industry produce uncertainty concerning the health impacts of smoking.
- Formed the Marshall Institute to defend “Star Wars” which later segued into global warming denial.

Seitz Continued

- Questioned that CFC's were threats to the ozone layer
- Believed second hand smoke was not a problem
- Did not believe greenhouse gas emissions played a role in global warming
- Was very vocal and had the ear of presidents/legislators
- Marshall Institute heavily funded by oil interests, esp. Exxon Mobil

Fred Singer

- BS Ohio State/PhD Princeton
- Impressive academic and governmental science career
- Distrust of federal regulations and faith in free markets
- Routinely went against mainstream thinking
- Part of the Marshall Institute
- Denied secondhand smoke caused cancer
- Denied acid rain was a problem
- Denies anthropogenic climate change

Bill Nierenberg

- Columbia PhD
- Director of Scripps Institute
- Co founder of Marshall Institute
- Similar pattern in denial of acid rain, global warming, etc.

Merchants of Doubt

- Strategic Defense Initiative (Star Wars)
- Acid Rain
- Ozone Hole
- Tobacco
- Climate Change

Exxon/Mobil

- Exxon Mobil became aware of human-caused global warming caused by burning of fossil fuels in the 1950s.
- Throughout the 1960s, 1970s, and 1980s documentation shows the results of studies by Exxon scientists and discussion in strategic plans of the impact of climate change on the world and on their business.
- Then in the late 1980s Exxon/Mobil became a climate change denier
 - Advertisements
 - Funding of think tanks supporting denial
 - Lobbying efforts
 - Campaign contributions
- Currently legal action is pending against Exxon in several jurisdictions

American Business Act on Climate Change

- 154 Companies
- 50 states
- 11 million employees
- \$7 trillion in market cap
- \$4.2 trillion in revenues

Walmart

Initiative	Commitment	Progress
Reducing energy intensity and emissions in our own operations	To be supplied by 100 percent renewable energy.	Supplied by 25 percent.
	Drive the production or procurement of 7 billion kWh of renewable energy by the end of 2020.	Installed or contracted for more than 2 billion kWh from more than 470 projects worldwide.
	By end of 2020, reduce kWh-per-square-foot energy intensity of Walmart facilities by 20 percent versus 2010 baseline.	Reduced kWh-per-square-foot energy intensity by 10 percent, which represents a 1 percent absolute reduction since the end of 2014.
	Begin phasing out HFC refrigerants as of 2015 in favor of non-HFC where these are legally allowed and available for new purchases of point-of-sale units and large refrigeration installations.	Continued incorporating refrigeration and store designs that enable the transition to less HFC-reliant systems, while also testing HFC-free systems in several markets.
	Double U.S. fleet efficiency by the end of 2015.	Achieved in October 2015, saving nearly \$1 billion in FY16 and avoiding CO2 emissions of nearly 650,000 metric tons of CO2.
	Engage 70 percent of our China-sourced business in a factory energy efficiency program by 2017.	Trained more than 500 factories in China on RedE tool.
	Eliminate 20 million metric tons (MMT) of GHG emissions	Surpassed: reported reduction of 35.6 million metric tons.

Global Footprint

- Human activities consume resources and produce waste
- Ecological Footprint Accounting addresses whether the planet is large enough to keep up with the demands of humanity.
- Biocapacity represents the planet's biologically productive land areas including our forests, pastures, cropland and fisheries
- Biocapacity can then be compared with humanity's *demand* on nature: our **Ecological Footprint**. The Ecological Footprint represents the productive area required to provide the renewable resources humanity is using and to absorb its waste.

- How can we all live well and live within the means of one planet?

- Our current global situation: *Since the 1970s, humanity has been in ecological overshoot with annual demand on resources exceeding what Earth can regenerate each year.*
- It now takes the Earth one year and six months to regenerate what we use in a year.
- We maintain this overshoot by liquidating the Earth's resources. Overshoot is a vastly underestimated threat to human well-being and the health of the planet, and one that is not adequately addressed.

- For 9 billion people (midrange projection for 2050) to live at North American/Western European standards will require 5 planets.